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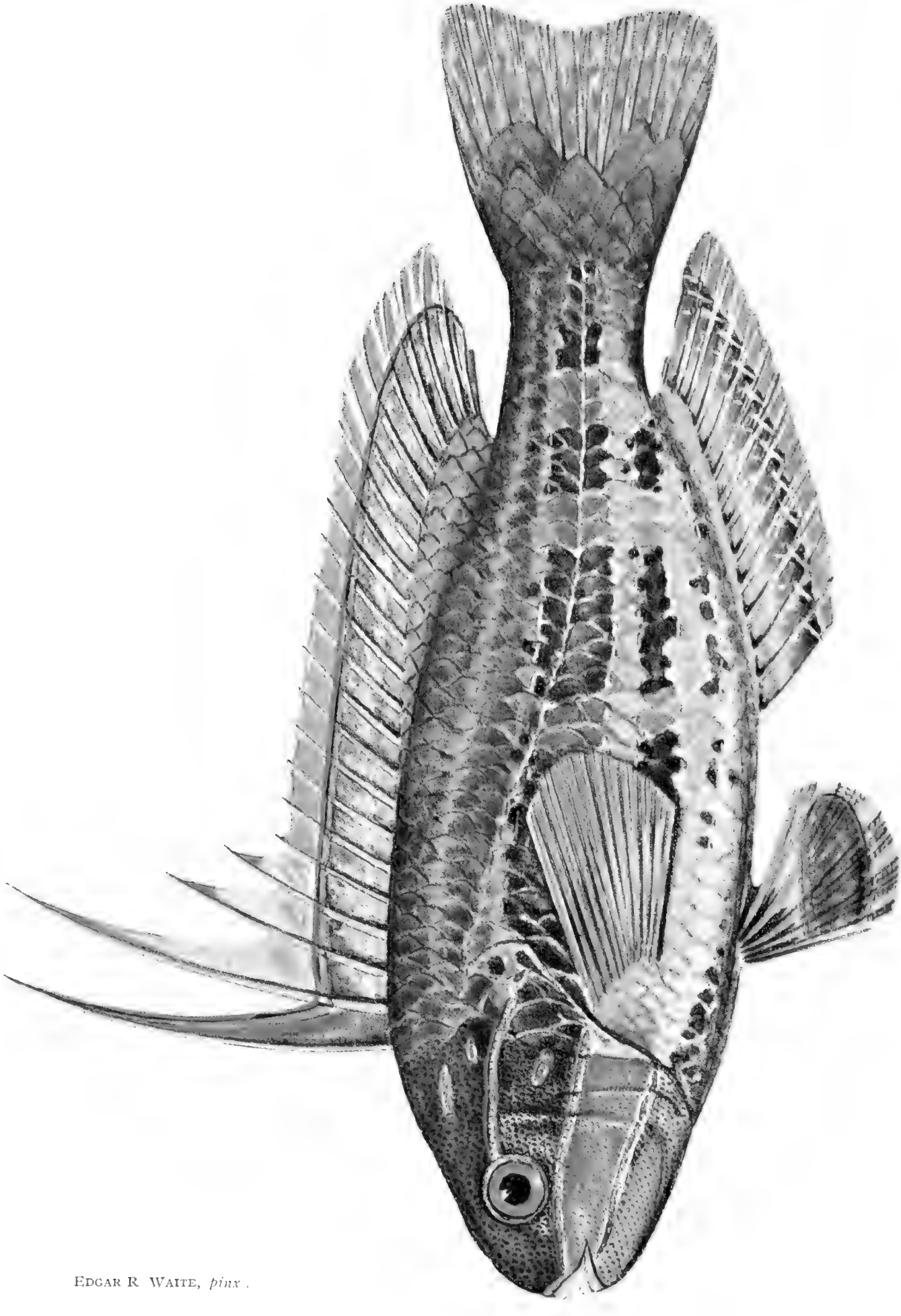


EDGAR R. WAITE, *pinx.*

HETEROSCARUS FILAMENTOSUS Cast.

X 547(942)

CATALOGUE

OF THE

FISHES OF SOUTH AUSTRALIA.

By EDGAR R. WAITE, F.L.S., Director South Australian Museum.

Plate i and Text fig. 1—332.

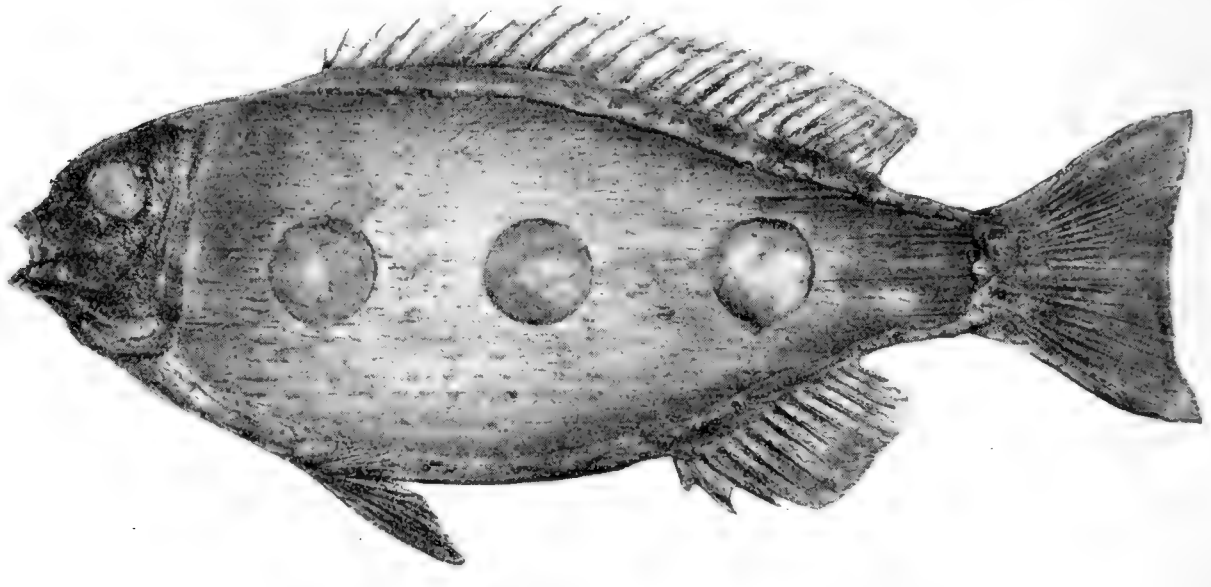
The primary object of the catalogue is to record the present state of our systematic knowledge of the fishes found in the seas and fresh waters of South Australia. In doing this, however, it is recognized that the list is a mere foundation, known to be incomplete, but supplied as a basis upon which to build. Examination of much material and consequent revision of the catalogue, as it now stands, will be necessary, but were publication to be withheld until this is accomplished, the list could not be issued for many years to come. The want of a key to the literature of our fishes is a deterrent to would-be students, who might otherwise feel inclined to take up the study: to such the list will be useful and an incentive. The angler desires to know more than the fisherman's names of his spoils; to him the illustrations, and through them references to literature, will be appreciated and may lead to a wider view of the subject. The interest evinced in this catalogue by officers in the Department of Fisheries indicates that the production will be welcomed by professional fishermen, and though a more popular publication would naturally be preferred by the public generally, it is hoped that the illustrations and accompanying remarks will be appreciated by those to whom the subject of fish is one of utilitarian, rather than of strictly scientific import.

As indicated by the title, the list is confined to an enumeration of the fishes known from the State of South Australia, as politically defined: it therefore includes species recorded from the Great Australian Bight. The western border of the State is the 129th meridian of East longitude, but as it would scarcely be practicable to extend this limit to the ocean, the fishes recorded from the whole of the Bight (the littoral of Western Australia excepted) have been included.

Hemmed in as South Australia is, and possessing only a southern seaboard, the marine fauna is conspicuous by the absence of tropical forms, which to a greater or lesser extent occur on the shores of other continental States. Some of the species included in the catalogue are certainly nominal only, but, on the other hand, many remain to be defined, and it is hoped that the publication of the list, imperfect though it is, may be the means of stimulating interest and thus

increasing our knowledge of the subject. Workers on the fish fauna of South Australia, present or prospective, will in the course of their reading come across species accredited to South Australia that do not appear in this catalogue. The Zoological Record, for example, for the year 1872, compiled by Dr. Günther, furnishes several such instances. In that year Klunzinger(1) published a paper under the title, "Zur Fischfauna von Süd-Australien." A glance at the localities supplied shows that the translation should have been Southern Australia, but Günther rendered it as South Australia, which has, of course, a definite and restricted meaning. All the localities given by Klunzinger are Victorian, hence the species therein listed, unless otherwise supported, are not to be included in the fauna of South Australia. Günther also used South Australia in a similar sense in his own writings, and species therefor included by others do not appear in this catalogue. Such, for example, is *Melambaphes nigroris*, which was defined in a paper bearing the title "On New Species of Fishes from Victoria, South Australia" (2).

It is well known that many of the species named by Castelnau are ill-founded, but as the descriptions are for the most part meagre, the recognizable ones often inaccurate, and the types, if existing, not accessible, there is little hope of ascertaining the status of several such species named by this author.



Illustrating Count Castelnau's method of taxidermy.

It may be of interest to describe the method employed by Count Castelnau to preserve the larger of his specimens. One side of the fish was skinned and, the rather more than half skin, was tacked on to a piece of board, cut more or

(1) Klunzinger, Arch. f. Naturg., xxxviii, 1872, p. 17-47, pl. ii.

(2) Günther, Ann. Mag. Nat. Hist. (3), xi, 1863, p. 115.

less accurately to the shape of the specimen. The space between the skin and the board was stuffed with sawdust through holes previously cut in the board; the holes were then filled with cotton wadding to prevent the sawdust escaping. The process was usually completed by pasting a piece of newspaper over the board, thus keeping the wadding in place. A glass eye was fixed in the orbit of the show side and the specimen generously varnished. The accompanying illustration is from an example of *Tephraeops zebra*, so treated and preserved, with some others, in this Museum.

The Government has assisted the publication of the catalogue, financially, and, at the instance of the Department of Fisheries and Game, asked that its scope should be extended to interest a larger number of users than would obtain if the list were restricted to purely systematic records. To this end the number of illustrations has been greatly increased. It was originally intended to supply, as far as possible, a figure of a representative species of each genus; as it now stands all species of which a useable picture could be obtained are illustrated. These illustrations will assist in arriving at an approximate disposition in the system of any specimen obtained; they must not, however, be relied upon for absolute determinations; important features, such as the nature of the teeth and squamation and certain comparative dimensions not being indicated. First choice of illustrations has been made from the published drawings by Mr. A. R. McCulloch and myself, either jointly or separately; photographs of casts made in the Museum by the formator, Mr. Robert Limb, under my supervision, and coloured by Mr. G. A. Barnes, have also been used, but the bulk of the figures are culled from illustrations which have appeared in scientific literature published in different parts of the world, the source of which will generally be found in the references to the species to which they are assigned.

To meet the requirements of the public, as represented by the Fisheries Department, short explanatory notes are appended to the entries of many of the species, especially such as are used for food.

I have also been asked to supply "common names" for the fishes; where such names exist, these are given: many fishes, however, have no such names, for some of these more or less appropriate ones have been furnished. The edible fishes have, naturally, been named by the public, but such names vary greatly in the different States, and Mr. D. G. Stead has written a pamphlet "On the need for more uniformity in the vernacular names of Australian Edible Fishes."(3) Where known, the aboriginals' names of fishes have been furnished, and some of these, as for example "Mulloway" for the Butter-fish *(Sciaena antarctica)*,

(3) Stead, Publications, Fisheries Branch, N.S.W., 1911, 12 p.

are even more commonly used than their English cognomens. The contractions "syn." and "ref." appended to some of the entries denote that further synonomy or references will be found in the publications so indicated. Slight differences in spelling names in the synonomy have not necessarily been observed; for example, separate entries are not made for *Cheilodactylus* and *Chilodactylus*. The dates supplied are, so far as it has been possible to ascertain them, those of actual publication; for example, the Report of the British Association for the year 1842 was published in 1843; references to species recorded in this volume are therefore dated 1843.

The catalogue has been reprinted, or rather duplicated, for the State Department of Fisheries and Game, with identical pagination and date of publication, the only deviation from the original being the substitution of the special title page issued with the copies printed for the Department.

One cannot, of course, study the fishes of any given area without knowing what has been done elsewhere, but for present purposes it must suffice to indicate the principal systematic works that have been published in Australasia.

The completion, in 1870, of Dr. Albert Günther's monumental work (4) provided a stimulus for the preparation of local catalogues.

New Zealand. The first to appear was Captain F. W. Hutton's catalogue (5) issued in 1872, followed, in 1893, by Dr. Theodore Gill's "Comparison of Antipodal Faunas" (6). In 1904 Hutton produced another list (7). The latest published catalogue, issued in 1907, is "A Basic List of the Fishes of New Zealand," by Edgar R. Waite (8).

Australia. Sir William Macleay's "Descriptive Catalogue of Australian Fishes" (9) was published in 1880, 1881, and was closely modelled on Günther's work, but original observations and descriptions were introduced.

Tasmania. The fishes of Tasmania were included in Macleay's catalogue, above mentioned, but in 1883 they were separately listed by R. M. Johnston, under the title "General and Critical Observations on the Fishes of Tasmania" (10), which list, as in the case of some of the other works recorded, was later revised.

New South Wales. In 1886 J. Douglas Ogilby (11) published the first catalogue restricted to the fishes of the State. In 1904 Waite issued a list under

(4) Günther, Cat. Fish. Brit. Mus., i-viii, 1859-1870.

(5) Hutton, Fishes of New Zealand: Catalogue with diagnoses of the species, 1872.

(6) Gill, Nat. Acad. Sciences, Wash., vi, 1893.

(7) Hutton, Index Faunae Novae Zealandiae, 1904.

(8) Waite, Rec. Cant. Mus., i, 1907, 1912.

(9) Macleay, Proc. Linn. Soc. N.S.Wales, v, 1880; vi, 1881; ix, 1884.

(10) Johnston, Pap. and Proc. Roy. Soc. Tasm., 1883, 1891.

(11) Ogilby, Catalogue of the Fishes of N.S.Wales with their principal synonyms, 1886.

the title "Synopsis of the Fishes of New South Wales" (12). This, in turn, is to be superseded by an "Illustrated Check-list," by Allan R. McCulloch (13), of which a first part appeared in 1919.

Victoria. The only list of Victorian fishes extant was produced by A. H. S. Lucas in 1880, under the title "A Systematic Census of Indigenous Fish, hitherto recorded from Victorian Waters" (14).

Queensland. The publication of a "Check-list of the Cephalochordates, Selachians and Fishes of Queensland" has been undertaken by Ogilby (15), but so far one part only, published in 1916, and dealing with the *Protochordata Marsipobranchii* and *Isospondyli*, has appeared. I understand it is doubtful if the state of my old colleague's health will permit him to continue the work.

South Australia. The present catalogue is the first completed list of the fishes of South Australia to be published, though one previous attempt is to be chronicled. In 1908, 1909, A. H. C. Zietz issued three parts under the title, "A Synopsis of the Fishes of South Australia" (16). The *Leptocardii, Cyclostomata* and portion of the *Teleostei* were included.

Western Australia. A bare list of the fishes of this State, compiled by Bernard H. Woodward, was published in 1902 (17).

General subject. Though not confined to strictly systematic records, the following publications may be mentioned:

R. A. A. Sherrin, Handbook of the Fishes of New Zealand, 1886.

J. E. Tenison Woods, Fish and Fisheries of New South Wales, 1883.

J. Douglas Ogilby, Edible Fishes and Crustaceans of New South Wales, 1893.

F. G. Aflalo, A Sketch of the Natural History of Australia, 1896.

David G. Stead, Fishes of Australia, 1906.

David G. Stead, Edible Fishes of New South Wales, 1908.

T. G. Roughley, Fishes of Australia and their Technology, 1916.

The publications of scientific Societies and Institutions in many parts of the world contain articles on Australian fishes, and references to most of these will be found in the text.

ACKNOWLEDGMENTS. I am indebted to the Trustees of the Australian Museum for lending books and the beautiful drawings made, in illustration of

(12) Waite, Mem. N.S.Wales Nat. Club, No. 2, 1904.

(13) McCulloch, Aust. Zoologist, i, 1919.

(14) Lucas, Proc. Roy. Soc. Viet. (n.s.), ii, 1890.

(15) Ogilby, Mem. Queensl. Mus., v, 1916.

(16) Zietz, Trans. Roy. Soc. S. Aust., xxxii, 1908; xxxiii, 1909.

(17) Woodward, Western Australian Year Book, 1902.

Mr. McCulloch's papers, either by himself or Miss Phyllis Clarke; to the Director of the National Museum, Melbourne, for the loan of books, and to my Assistant, Mr. Herbert M. Hale, for taking the photographs of the casts of fishes in this Museum and for much general help.

INTRODUCED FISHES.

A number of exotic fishes have been introduced into South Australia; the majority are kept in private tanks and aquaria and need not be enumerated. Five species, however, have been liberated for economic purposes, and are firmly established as denizens of our fresh waters; they are:

Gold Carp (*Carassius auratus* Linn.). Asia, *via* Europe.
Tench (*Tinca tinca* Linn.). Europe.
Perch (*Perca fluviatilis* Linn.). Europe.
Brown Trout (*Salmo trutta* Linn.). Europe.
Rainbow Trout (*Salmo irideus* Gibbons). California.

All of these, excepting the Carp, were intentionally introduced into South Australia. The Trout were placed in the various reservoirs, and have thriven immensely; a Brown Trout was recently caught measuring 2 ft. 10½ in. in length. The Carp were originally introduced into Victoria, and entered our waters by way of the River Murray. I have seen hundreds of thousands of them taken from the irrigation drains and loaded into carts, but Adelaide did not receive a single fish, most of them being railed to Melbourne, where selling prices are higher than even in Adelaide. In consequence of this, the majority of our inland fishes are sent to the Victorian capital, and large numbers of marine species also, the exceptions being from such places as are within easy reach of our city.

E. R. W.

South Australian Museum,
Adelaide, 21st February, 1921.

THE FISHES
OF
SOUTH AUSTRALIA

KEY TO THE DESIGNATIONS OF FISH-LIKE VERTEBRATES.

a. No localized brain, no protective skull, no heart ..	ACRANIA (Lancelets)
aa. Anterior end of central nervous axis developed into a brain and protected by a skull, heart present	CRANIATA (Lampreys, Fishes and higher Vertebrates)
b. Nostril single, median; no mandible, no limbs or limb-girdles	CYCLOSTOMATA (Lampreys)
bb. Nostrils paired; mandible, limb-girdles and limbs usually present, developed as rayed fins, gills persistent	PISCES (Fishes)

ACRANIA (LANCELETS).

FAMILY BRANCHIOSTOMIDAE.

EPIGONICHTHYS Peters, 1876 (cultellus).

EPIGONICHTHYS BASSANUS Günther (Southern Lancelet).

Branchiostoma bassanum Günth., Voy. Alert, Zool., 1884, p. 31.
Heteropleuron bassanum Kirkaldy, Q.J.M.S., xxxvii (n.s.), 1895, p. 314, pl. xxxiv, fig. 6.

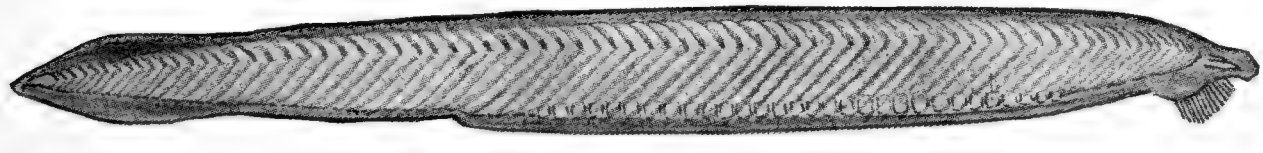


Fig. 1*. *Epigonichthys bassanus.*

This and the following species are small transparent marine animals, occurring near the shore and burrowing in the sand.

* The numbers of the illustrations are not necessarily consecutive, but represent the sequence of the species.

EPIGONICHTHYS AUSTRALIS Raff (S. Australian Lancelet).

Asymmetron australis Raff, Endeavour Res., i, 1912, p. 303, pl. xxxvii, fig. 1-7 (structure).

CRANIATA.

CLASS CYCLOSTOMATA (LAMPREYS).

a. A single median suproral lamina, developed from the upper arch of the annular cartilage, mouth fringes present .. .. PETROMYZONIDAE

aa. Two distant lateral laminae developed, mouth fringes rudimentary .. .. CARAGOLIDAE

FAMILY PETROMYZONIDAE.

GEOTRIA Gray, 1851 (australis).

GEOTRIA AUSTRALIS Gray (Wide-mouthed Lamprey).

Geotria australis Gray, Chondropt., 1851, p. 142, pl. ii and P.Z.S., 1851, p. 239, pl. iv, fig. 3 and pl. v; Ogil., P.L.S., N.S.W., xxi, 1896, p. 422.

Geotria allportii Günth., P.Z.S., 1871, p. 675, pl. lxx.

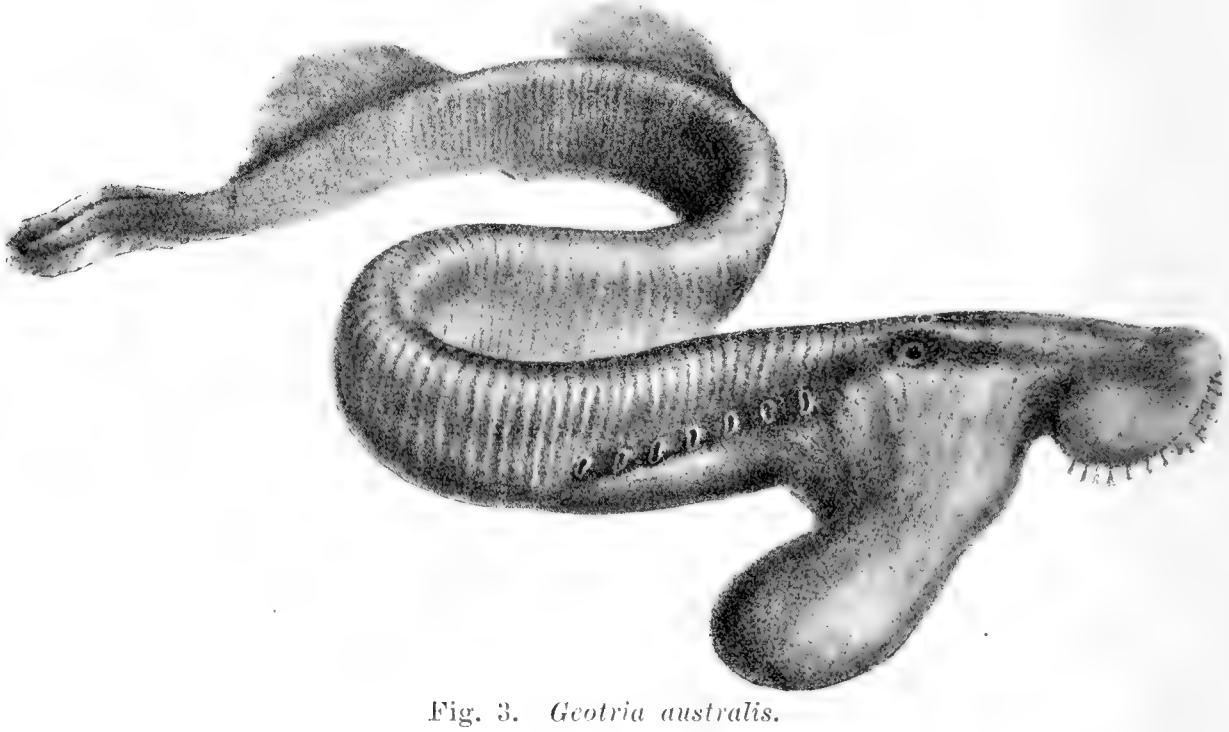


Fig. 3. *Geotria australis.*

Lampreys are eel-shaped animals which undergo a metamorphosis; in the earlier stages the eyes are rudimentary and teeth are entirely absent. When adult these parasites attach themselves to fishes and rasp off the flesh by means of the horny teeth with which the circular mouth is provided. Some examples, at least, of the Wide-mouthed Lamprey, develop a throat pouch, as illustrated.

FAMILY CARAGOLIDAE.

CARAGOLA Gray, 1851 (lapicida).

CARAGOLA MORDAX Richardson (Short-headed Lamprey).

Petromyzon mordax Rich., Zool. Ereb. and Terr., 1848, p. 62, pl. xxxviii, fig. 3-6.
Mordacia mordax Gray, Chondropt., 1851, p. 144, pl. i, fig. 6 and P.Z.S., 1851, p. 240, pl. iv, fig. 6 (mouth); Ogil., P.L.S., N.S.W., xxi, 1896, p. 400.

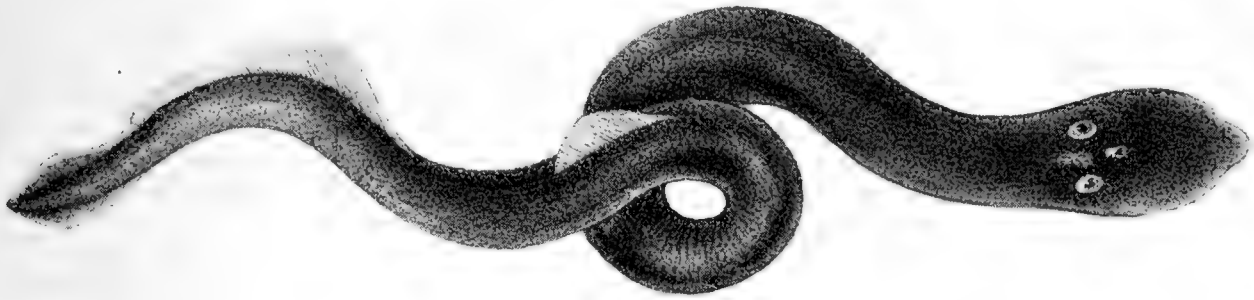


Fig. 4. *Caragola mordax.*

Before the construction of the weir this lamprey was very common in the River Torrens, which it ascended for breeding purposes; it is occasionally washed up on the ocean beaches.

CLASS PISCES (FISHES).

a. Skeleton cartilaginous, skull without membrane bones (opercles, suborbital ring, etc.); males with paired claspers.
  b. Gills with five to seven separate external openings .. .. — ELASMOBRANCHII (Sharks and Rays)
  bb. Gills with a single external opening .. .. — HOLOCEPHALI (Elephant Fishes)

aa. Skeleton usually bony, skull with membrane bones; males without paired claspers .. .. — TELEOSTOMI (True Fishes)

SUB-CLASS ELASMOBRANCHII (SHARKS AND RAYS).

a. Gill-openings on the sides; pectorals free from the head .. .. — SELACHII (Sharks)

aa. Gill-openings on the lower surface; pectorals attached to the head; no anal fin .. .. .. — BATOIDEI (Rays)

ORDER SELACHII (SHARKS).

FAMILY HEXANCHIDAE.

NOTORHYNCHUS Ayres, 1855 (maculatus).

NOTORHYNCHUS PECTOROSUS Garman (Seven-gilled Shark).

Heptranchus indicus Macdon. & Barr., P.Z.S., 1868, p. 371, pl. xxxiii.

Notidanus indicus Hutt., Cat. Fish. N.Z., 1872, p. 79; McCoy, Prod. Zool. Vict., dec. v, 1880, pl. xliii, fig. 2.

Heptranchias pectorosus Garm., Bull. Essex Inst., xvi, 1884, p. 56.

Heptranchias haswelli Ogil., P.L.S., N.S.W., xxii, 1898, p. 62.

Notorhynchus indicus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 5.

Notorhynchus pectorosus Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 20 (syn.).

Fig. 5. *Notorhynchus pectorosus.*

Most sharks and rays have five gill slits; this species and some of its allies have seven slits, also a single fin only on the back. The teeth likewise are most characteristic, and are dissimilar in each jaw.

FAMILY HETERODONTIDAE.

HETERODONTUS Blainville, 1816 (philippi).

HETERODONTUS PHILIPPI Bloch & Schneider (Port Jackson Shark).

Squalus philippi Bl. & Schn., Syst. Ichth., 1801, p. 134.

Heterodontus philippi Blainv., Bull. Soc. Phil., 1816, p. 121; McCoy, Prod. Zool. Vict., dec. xii, 1886, pl. cxiii.

Cestracion philippi Less., Voy. Coquille, Zool., ii, 1830, p. 97, pl. ii; Waite, J.L.S., xxv, 1896, p. 325, pl. xii, fig. 1, 2 (egg); Saville Kent, Nat. in Aust., 1897, p. 192, fig.

Centracion philippi Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 182 (ref.).

Sometimes called a living fossil, existing forms being but little different from species living in Palaeozoic ages. The crushing teeth are arranged obliquely and

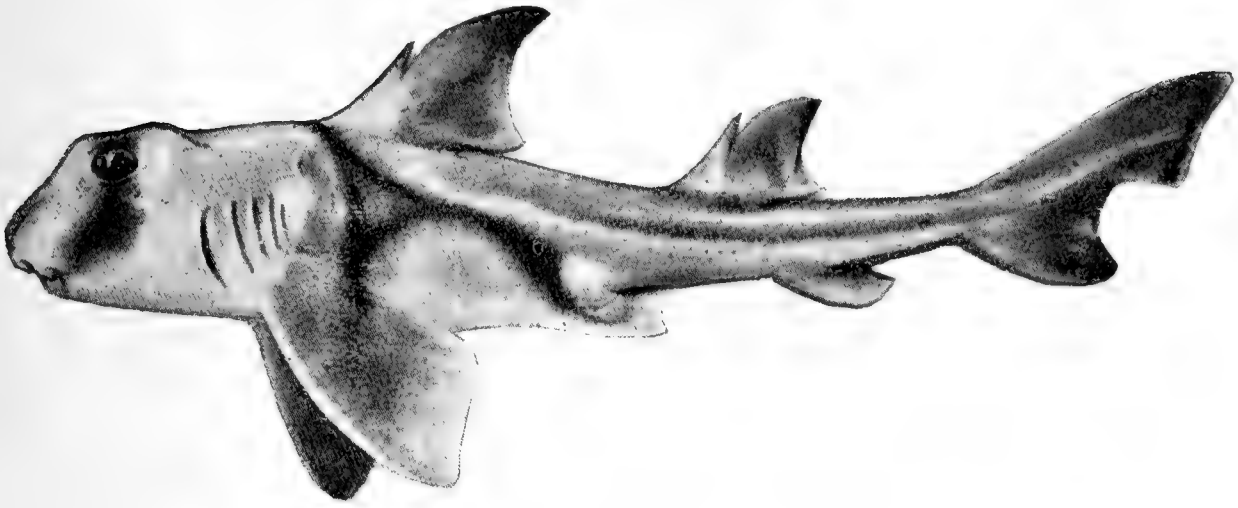


Fig. 6. *Heterodontus philippi.*

are often stained with colour from the spines of sea urchins: the egg-cases are formed of a double spiral.

FAMILY CARCHARINIDAE.

CARCHARINUS Blainville, 1816 (commersoni).

CARCHARINUS GANGETICUS Müller & Henle (Sea Shark).

Carcharias gangeticus Müll. & Henle, Plagiost., 1838, p. 39, pl. xiii; Day, Fish. India, 1878, p. 715, pl. clxxxvii, fig. 1.

Carcharinus gangeticus Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 139.

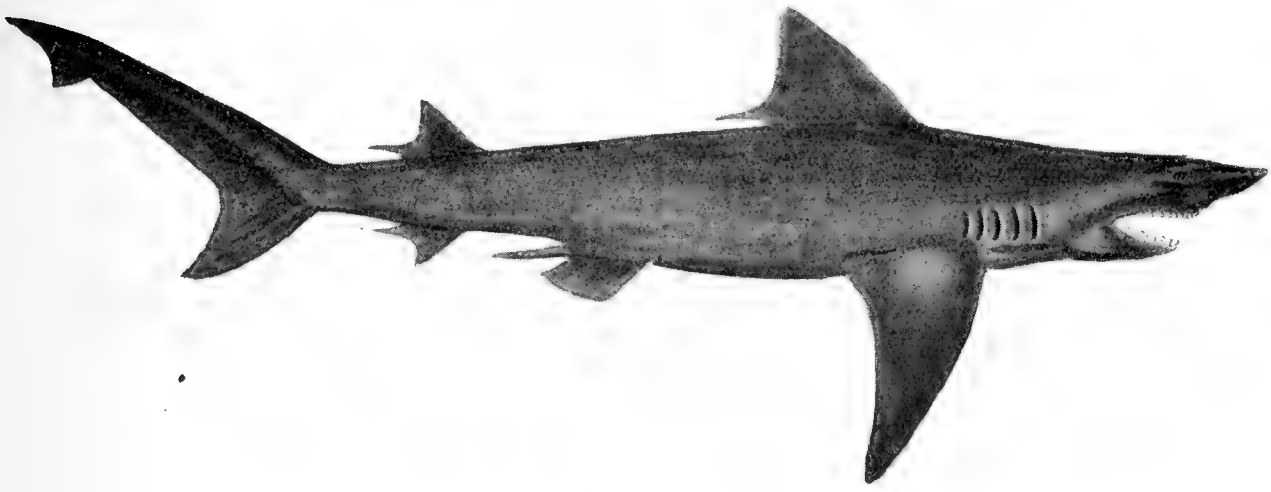


Fig. 7. *Carcharinus gangeticus.*

Though known from Australian seas, this species is much more common in Indian waters, where it attains to nine feet in length. It is one of the most ferocious of Indian sharks and frequently attacks bathers, even in the Hoogly at Calcutta.

CARCHARINUS BRACHYURUS Günther (Whaler).

Carcharias brachyurus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 369; Waite, Rec. Aust. Mus., vi, 1906, p. 226, pl. xxxix.

Carcharias macrurus Rams. & Ogil., P.L.S., N.S.W. (2) ii, 1888, p. 163.

Fig. 8. *Carcharinus brachyurus.*

The name "Whaler" is said to have been bestowed by the whale fishers of Twofold Bay, N.S.W., from the circumstance that it is this shark that usually appears during the whaling operations there carried on.

HYPOPRION Müller & Henle, 1838 (macloti).

HYPOPRION HEMIODON Müller & Henle.

Carcharias hemiodon Müll. & Henle, Plagiost., 1838, p. 35, pl. xix (teeth); A. Zietz, T.R.S., S.A., x, 1888, p. 303.

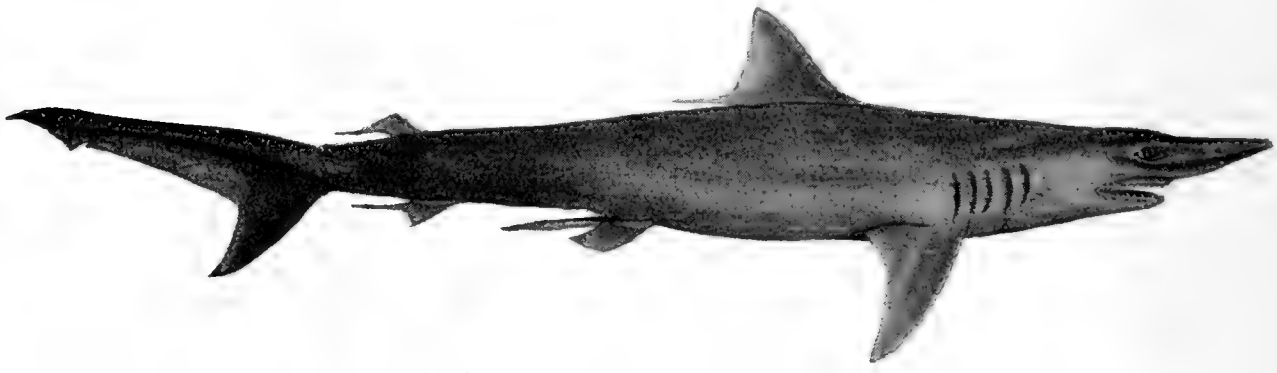


Fig. 9. *Hypoprion macloti.*

The figure is of *Hypoprion macloti*, an allied species, the type of the genus.

PRIONACE Cantor, 1849 (glauca).

PRIONACE GLAUCUM Linnaeus (Blue Shark).

Squalus glaucus, Linn., Syst. Nat. (ed. x), 1758, p. 235.

Prionace glauca Jord. & Everm., Bull. 47, U.S. Nat. Mus., i, 1896, p. 33 and iv, 1900, pl. iv, fig. 16.

Galeus glaucus Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 145, pl. iii, fig. 1-3 (syn.).

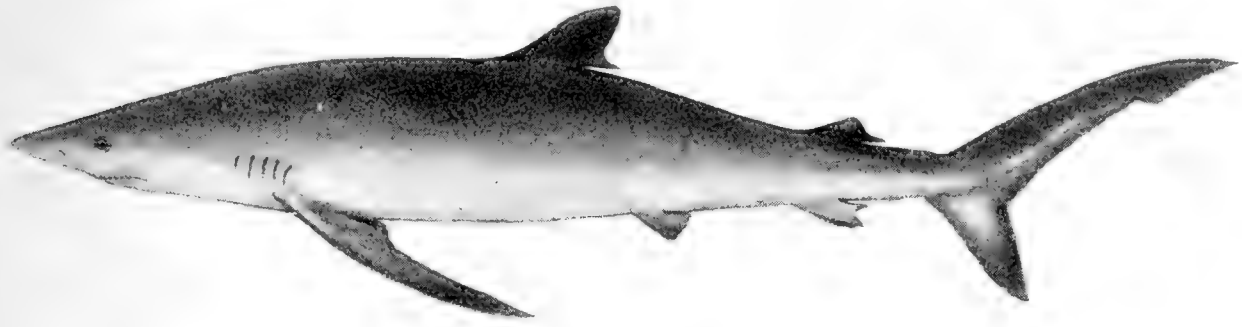


Fig. 10. *Prionace glaucum.*

Not common in Southern Australian waters, but examples from South Australia are preserved in the Museum.

GALEOCERDO Müller & Henle, 1837 (arcticus).

GALEOCERDO ARCTICUS Faber (Tiger Shark).

Squalus arcticus Faber, Fischer Islands, 1829, p. 17.

Galeocerdo arcticus Müll. & Henle, Arch. f. Naturg., iii, 1837, p. 308.

Galeocerdo tigrinus and *G. arcticus* Müll. & Henle, Plagiost., 1837, p. 59, 60, pl. xxiii, xxiv.

Galeocerdo rayneri Macdon. & Barr., P.Z.S., 1868, p. 368, pl. xxxii; Day, Fish. India, 1878, p. 718, pl. clxxxvii, fig. 3.

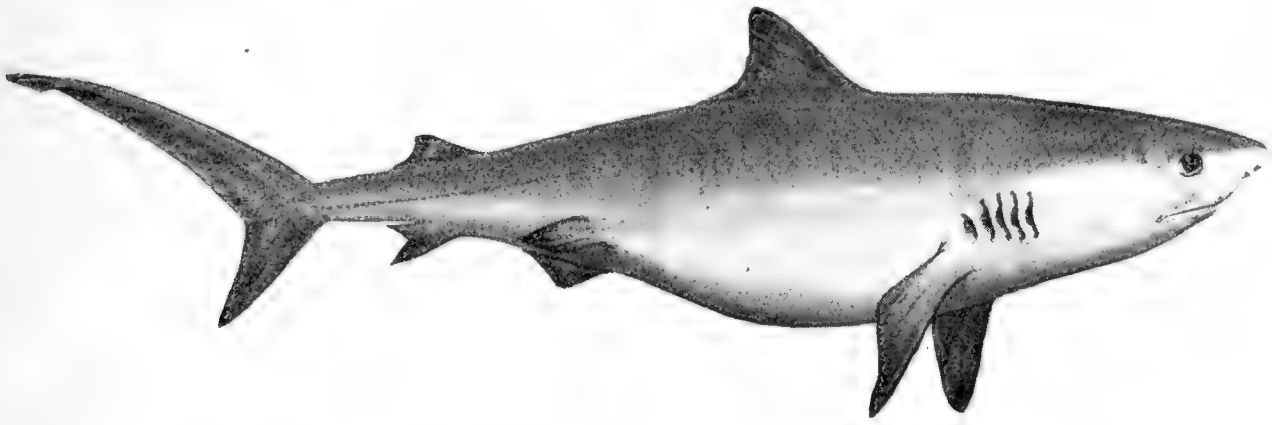


Fig. 11. *Galeocerdo arcticus.*

Attains to a length of sixteen feet, and is said to be "the most cunning and ferocious of all the scourges of the sea."

GALEUS Rafinesque, 1810 (galeus).

GALEUS AUSTRALIS Macleay (School Shark).

Galeus australis, Macl., P.L.S., N.S.W., vi, 1881, p. 354; McCoy, Prod. Zool. Vict., dec. vii, 1882, pl. lxiv, fig. 2; Waite, Rec. Cant. Mus., i, 1909, p. 139, pl. xv (young).

Galeorhinus australis Hutt., Index Faunae N.Z., 1904, p. 54.

Fig. 12. *Galeus australis.*

A very common and prolific species, as many as fifty living young being produced, which accompany the mother for some time after birth.

FAMILY MUSTELIDAE.

MUSTELUS Linck, 1790 (mustelus).

MUSTELUS ANTARCTICUS Günther (Gummy or Sweet William).

Mustelus antarcticus Günth., Cat Fish. Brit. Mus., viii, 1870, p. 387; Parker, T.N.Z. Inst., xv, 1883, p. 219, pl. xxx (embryos); McCoy, Prod. Zool. Vict., dec. ix, 1884, pl. lxxxvii; McCull., Rec. Aust. Mus., vii, 1909, p. 315, pl. xc, fig. 3.

Galeus antarcticus Waite, Rec. Aust. Mus., iv, 1902, p. 175, fig. 19 (fœtus and shell-gland).

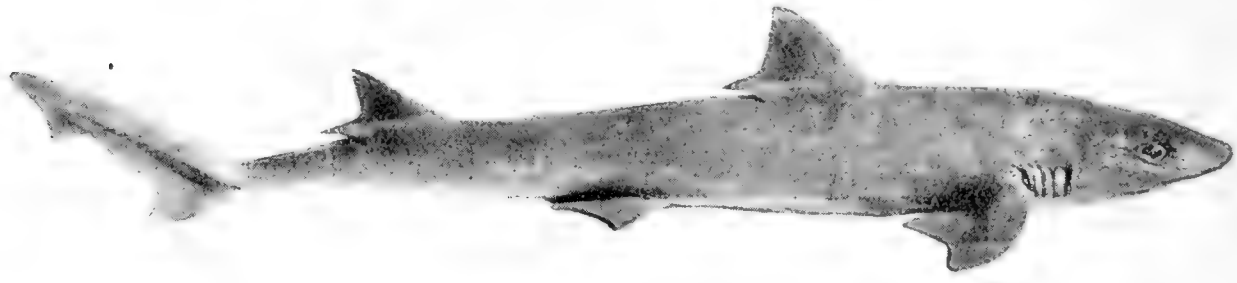


Fig. 13. *Mustelus antarcticus.*

The young are produced alive, each in a separate compartment of the uterus, but there is no vascular connection between the fœtus and the mother, unlike the remarkable condition occurring in one of the northern species of the genus.

FAMILY SPHYRNIDAE.

SPHYRNA Rafinesque, 1810 (zygaena).

SPHYRNA ZYGAENA Linnaeus (Hammer-headed Shark).

Squalus zygaena Linn., Syst. Nat. (ed. x), 1758, p. 234.

Zygaena lewini Lord (in Griffith), Anim. King., x, 1834, p. 640, pl. 1.
Zygaena malleus Day, Fish. India, 1878, p. 719, pl. clxxxvi, fig. 4; McCoy, Prod. Zool. Vict., dec. vi, 1881, pl. lvi, fig. 1.
Cestracion zygaena Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 157, pl. i, fig. 1-3 (ref.).

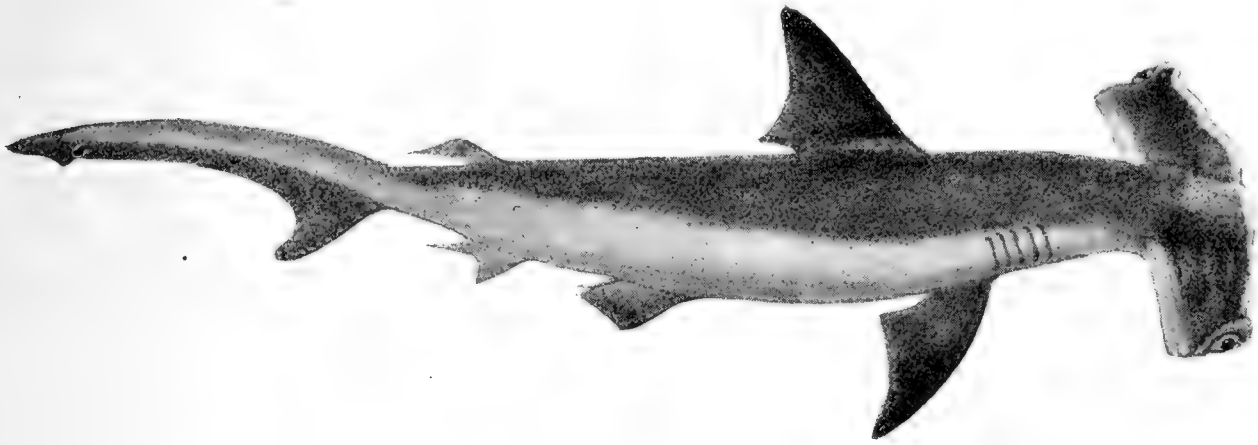


Fig. 14. *Sphyrna zygaena.*

Several species of Hammer-heads are known, but in none is the "hammer" so pronounced as in this one. The Shark grows to a length of fifteen feet. As many as thirty-seven embryos have been taken from a female eleven feet in length.

FAMILY ORECTOLOBIDAE.

ORECTOLOBUS Bonaparte, 1837 (barbatus).

ORECTOLOBUS MACULATUS Bonnaterre (Common Carpet Shark).

Squalus maculatus Bonn., Encycl. Meth., Ichth., 1788, p. 8.
Squalus barbatus Gmel., Syst. Nat., i, 1789, p. 1493.
Crossorhinus barbatus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 414; McCoy, Prod. Zool. Vict., dec. v, 1880, pl. xliii, fig. 1.
Orectolobus maculatus Ogil. & McCull., P.R.S., N.S.W., xlii, 1908, p. 273, pl. xlii, fig. 2.

Fig. 15. *Orectolobus maculatus.*

The Carpet Sharks, called Wobbegongs in the Eastern States of Australia, are sluggish bottom-haunting forms, where their remarkable colour patterns doubtless harmonize well with their varied surroundings.

ORECTOLOBUS DEVISI Ogilby (Banded Carpet Shark).

Crossorhinus barbatus McCoy, Prod. Zool. Vict., dec. v, 1880, pl. xliii, fig. 1 (not Gmel.).

Crossorhinus ornatus De Vis, P.L.S., N.S.W., viii, 1883, p. 289 (not Bonap.).

Orectolobus ornatus Regan, P.Z.S., 1908, p. 356, pl. xi, fig. 2 (young); Ogil. & McCull., P.R.S., N.S.W., xlii, 1909, p. 276, pl. xlii, fig. 1.

Orectolobus devisi Ogil., Mem. Qld. Mus., v, 1916, p. 181.

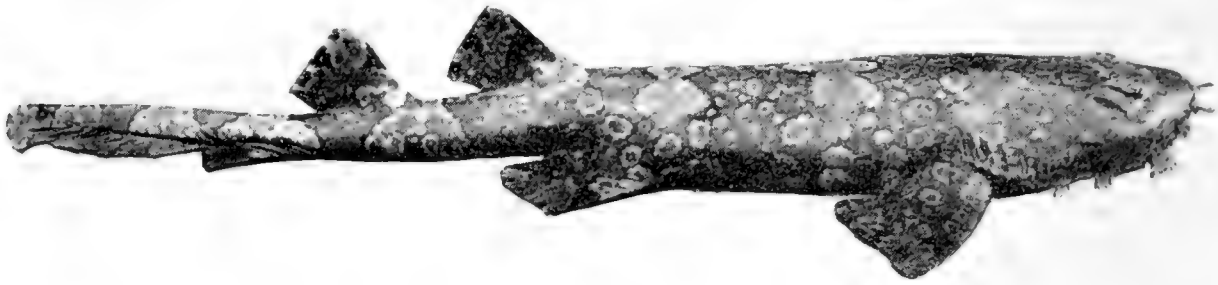


Fig. 16. *Orectolobus devisi.*

The illustration of this beautiful species is from the coloured cast of a specimen taken in St. Vincent Gulf: it measures six and a half feet in length.

ORECTOLOBUS TENTACULATUS Peters (Sombre Carpet Shark).

Crossorhinus tentaculatus Peters, Mon. Akad. Wiss. Berl., 1864, p. 123.

Orectolobus tentaculatus Regan, P.Z.S., ii, 1908, p. 357, pl. xii, fig. 2; Ogil. & McCull., P.R.S., N.S.W., xlii, 1908, p. 278.

Fig. 17. *Orectolobus tentaculatus.*

This is the least ornate of our three species; the illustration represents a young example, in which the dark markings are more conspicuous than in the adults.

PARASCYLLIUM Gill, 1861 (variolatum).

PARASCYLLIUM VARIOLATUM Duméril (Cat Shark).

Hemiscyllium variolatum Dum., Rev. & Mag. Zool., 1853, p. 121, pl. iii, fig. 1.
Parascyllium nuchale McCoy, Ann. Mag. Nat. Hist. (4), xiii, 1874, p. 15, pl. ii.
Parascyllium variolatum Gill, Ann. N.Y. Lyceum, vii, 1861, p. 413; McCull., Endeavour Res., i, 1911, p. 7, pl. ii, fig. 1.

Fig. 18. *Parascyllium variolatum.*

This and allied sharks are small species, seldom attaining to more than three feet in length; they are also known as Dogfishes, but the name "Cat Shark" is useful, as it serves to distinguish them from the "spiny dogs" of the Family Squalidae. The egg-cases of the Cat Sharks resemble those of the rays, familiarly known as "skate-barrows," but are of more elongate shape.

PARASCYLLIUM FERRUGINEUM McCulloch (Rusty Cat Shark).

Parascyllium ferrugineum McCull., Endeavour Res., i, 1911, p. 7, pl. ii, fig. 2, and text fig. 2; Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 459.

Fig. 19. *Parascyllium ferrugineum.*

Two specimens only are so far known, one from outside Port Philip, Victoria, the other from the Great Australian Bight.

FAMILY SCYLLIORHINIDAE.

SCYLLIORHINUS Blainville, 1816 (canicula).

SCYLLIORHINUS VINCENTI A. Zietz (Gulf Cat Shark).

Scyllium vincenti Zietz, T.R.S., S.A., xxxii, 1908, p. 287.

Scyliorhinus vincenti McCull., Endeavour Res., i, 1911, p. 4, pl. ii, fig. 3 and text fig. 1.

Fig. 20. *Scylliorhinus vincenti.*

A local species, occurring in shallow water and occasionally cast on to the ocean beaches after violent storms.

HALAELURUS Gill, 1861 (burgeri).

HALAELURUS ANALIS Ogilby (Spotted Cat Shark).

Scyllium maculatum Rams., P.L.S., N.S.W., v, 1880, p. 97 (not Günth.).
Scyllium anale Ogil., P.L.S., N.S.W., x, 1886, p. 445.
Catulus analis Waite, Mem. Aust. Mus., iv, 1899, p. 31, pl. ii, fig. 1 and Rec. Aust. Mus., vi, 1905, p. 228, pl. xl and fig. 38 (egg).
Halaelurus analis Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 85.

Fig. 21. *Halaelurus analis.*

Occurs in deeper water than the foregoing species, to which fact it doubtless owes its much more extended distribution.

FAMILY ALOPIIDAE.

ALOPIAS Rafinesque, 1810 (macrourus=vulpinus).

ALOPIAS VULPINUS Bonnaterre (Thresher).

Squalus vulpinus Bonn., Encycl. Meth., Ichth., 1788, p. 9, pl. lxxxv, fig. 349.
Alopias vulpes Day, Fish. Gt. Brit. and Irel., ii, 1884, p. 300, pl. clvii.
Alopecias vulpes McCoy, Prod. Zool. Viet., dec. ix, 1884, pl. lxxxviii.

Vulpecula marina Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 30, pl. vii, fig. 1-3 (syn.).

Fig. 22. *Alopias vulpinus.*

The long tail is employed to thresh the surface of the water around a school of fish so as to cause them to huddle together, in which frightened condition they fall an easy prey to the shark.

FAMILY CARCHARIIDAE.

CARCHARIAS Rafinesque, 1810 (taurus).

CARCHARIAS ARENARIUS Ogilby (Grey Nurse).

Odontaspis taurus McCoy, Prod. Zool. Vict., dec. vii, 1882, pl. lxiv, fig. 1 (not Rafin.).

Carcharias arenarius Ogil., Ann. Qld. Mus., x, 1911, p. 37.

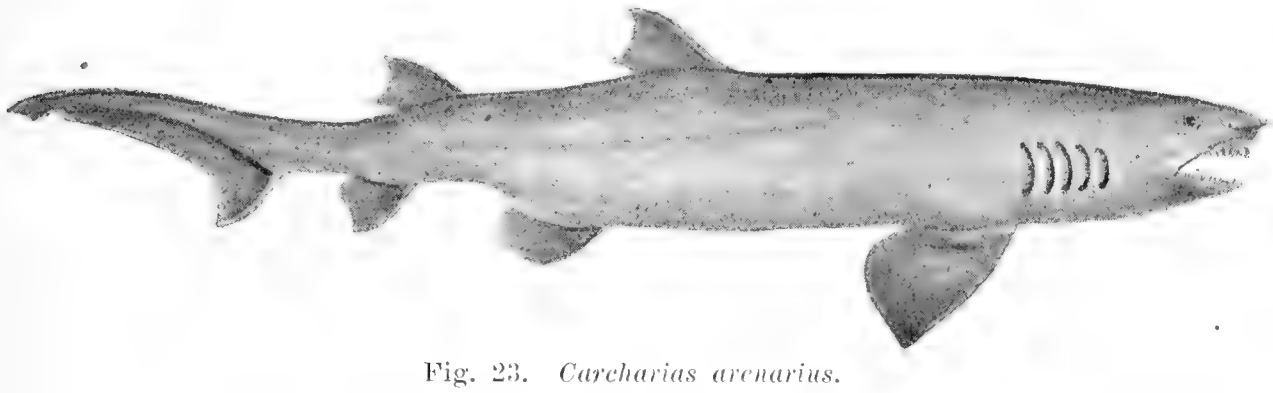


Fig. 23. *Carcharias arenarius.*

Fairly common in our waters, but apparently more so in Victoria, where it devours large quantities of edible fish and is a great terror to bathers.

CARCHARIAS TRICUSPIDATUS Day (Blue Nurse).

Odontaspis americanus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 392.

Carcharias tricuspidatus Day, Fish. India, 1878, p. 713, pl. clxxxvi, fig. 1.

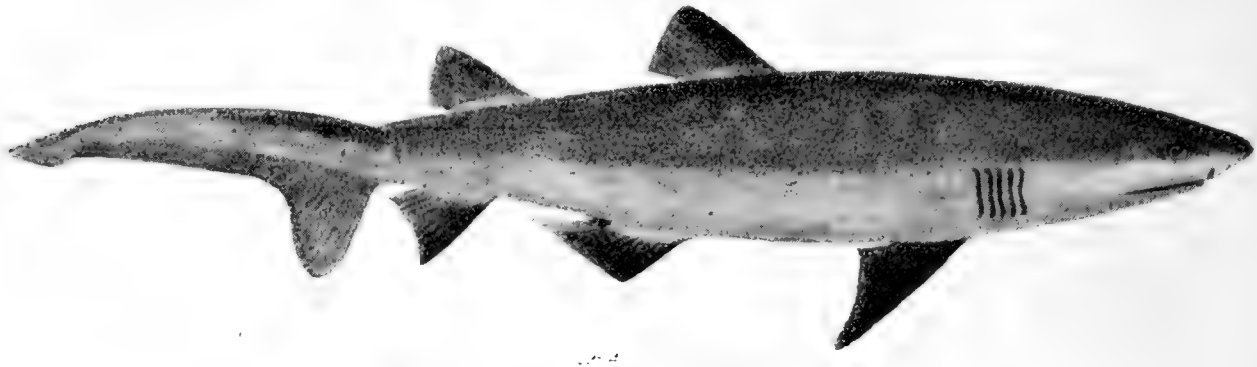


Fig. 24. *Carcharias tricuspidatus.*

Far from common here, but occurs plentifully in Indian seas, where it attains a length of at least twenty feet.

TRIAKIS Müller & Henle, 1838 (scyllium).

TRIAKIS SCYLLIUM Müller & Henle.

Triakis scyllium Müll. & Henle, Plagiost., 1838, p. 63, pl. xxvi; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 166 (ref.).

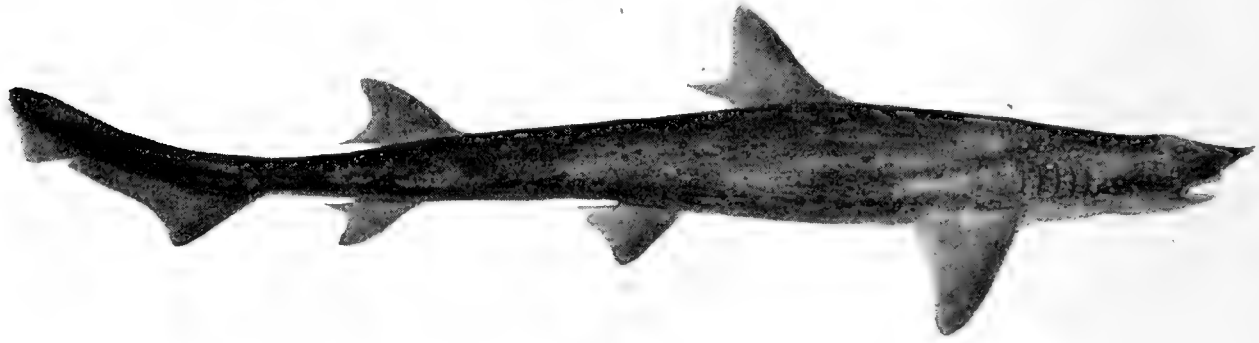


Fig. 25. *Triakis scyllium.*

This species is included on the evidence of a single specimen taken from the Semaphore Jetty in St. Vincent Gulf. It was originally described from Japan, and occurs also in the Indian Ocean.

FAMILY MITSUKURINIDAE.

MITSUKURINA Jordan, 1898 (owstoni).

MITSUKURINA OWSTONI Jordan (Elphin Shark).

Mitsukurina owstoni Jord., Proc. Cal. Acad. Sci. (ser. 3), i, 1898, p. 200, pl. xi, xii; A. Zietz, T.R.S., S.A., xxxii, 1908, p. 291.

?Scapanorhynchus jordani Huss., Bull. Am. Mus., xxvi, 1909, p. 257, pl. xliv. and text figs.

?Scapanorhynchus dofleini Engelh., Zool. Anz., xxxix, 1912, p. 644.

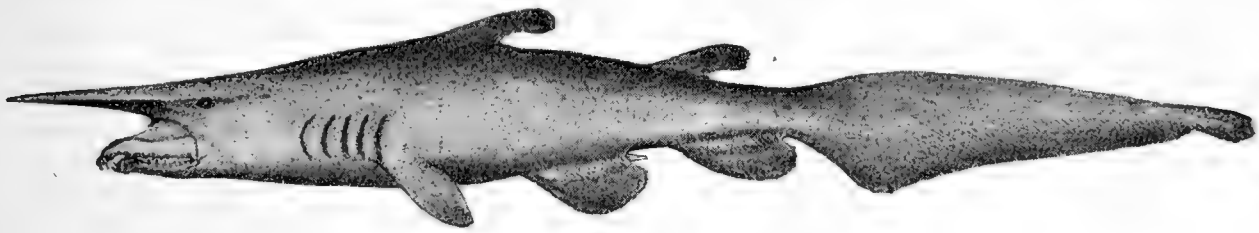


Fig. 26. *Mitsukurina owstoni.*

The size of the spiracle is doubtless variable and can scarcely be regarded as a specific character; its small size in the South Australian example accords with the description of *M. dofleini.* This specimen, the only one recorded from Australian waters, was caught at Goolwa within the River Murray mouth, in a seven-inch gill-net.

FAMILY ISURIDAE.

ISURUS Rafinesque, 1810 (oxyrhynchus).

ISURUS GLAUCUS Müller & Henle (Blue Pointer).

Oxyrhina glauca Müll. & Henle, Plagiost., 1838, p. 69, pl. xxix.
Lamna spallanzanii Day, Fish. India, 1878, p. 722, pl. clxxxvi, fig. 2.
Isurus glaucus Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 38 (ref.).

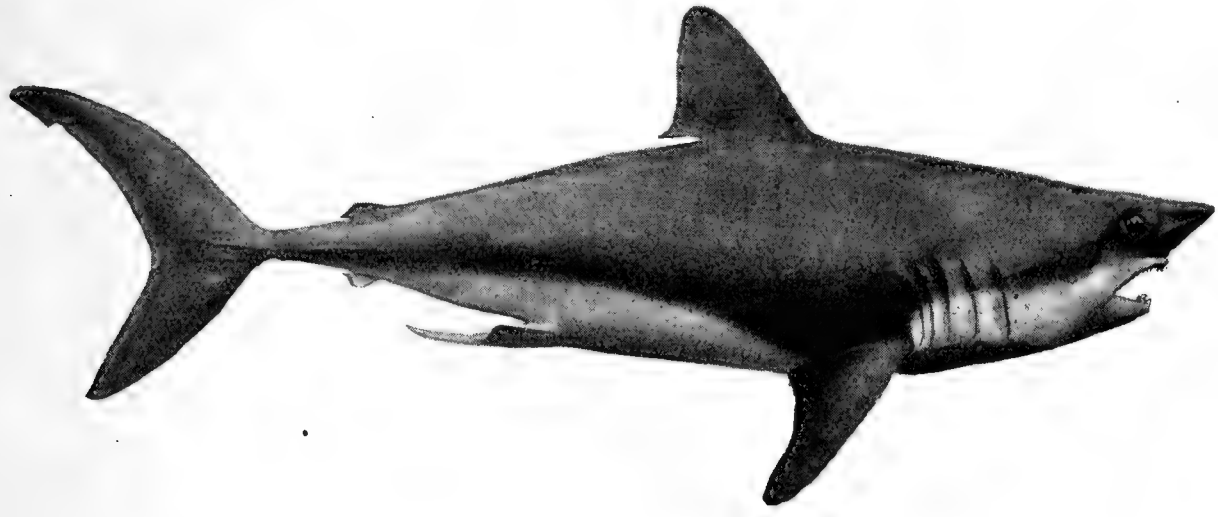


Fig. 27. *Isurus glaucus.*

Not to be confounded with the Blue Shark, which has small gill-slits and a very unequally-lobed tail.

CARCHARODON Müller & Henle, 1838 (rondeletii = carcharias).

CARCHARODON CARCHARIAS Linnaeus (White Pointer).

Squalus carcharias Linn., Syst. Nat. (ed. x), 1758, p. 235.

Carcharodon rondeletii Müll. & Henle, Mag. Nat. Hist. (2), ii, 1838, p. 37 and Plagiost., 1838, p. 70; McCoy, Prod. Zool. Vict., dec. viii, 1883, pl. lxxiv.

Carcharodon carcharias Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 32, pl. v, fig. 5-9 (syn.).

Fig. 28. *Carcharodon carcharias.*

The great Man-eating Shark; found in all warm seas, its distribution girdling the globe. It attains to between thirty-five and forty feet in length. Teeth of but recently extinct allies, dredged from the mid-Pacific, indicate that these huge sharks were quite ninety feet in length, or as long as the largest living whales.

FAMILY CETORHINIDAE.

CETORHINUS Blainville, 1816 (gunneri = maximus).

CETORHINUS MAXIMUS Gunner (Basking Shark).

Squalus maximus Gunn., Trondhj. Selsk. Skrift., iii, 1765, p. 33, pl. ii.

Selache maxima Cuv., Règ. Anim., ii, 1817, p. 129; Day, Fish. Gt. Brit. and Irel., ii, 1884, p. 303, pl. clviii, fig. 1.

Cetorhinus maximus Gerv., C.R. Acad. Sci. Paris, lxxxii, 1876, pl. cxxxviii; McCoy, Prod. Zool. Vict., dec. xi, 1885, pl. civ; Jord. & Ever., Bull 47, U.S. Nat. Mus., i, 1896, p. 51 and iv, 1900, pl. vii, fig. 23; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 39 (syn.).

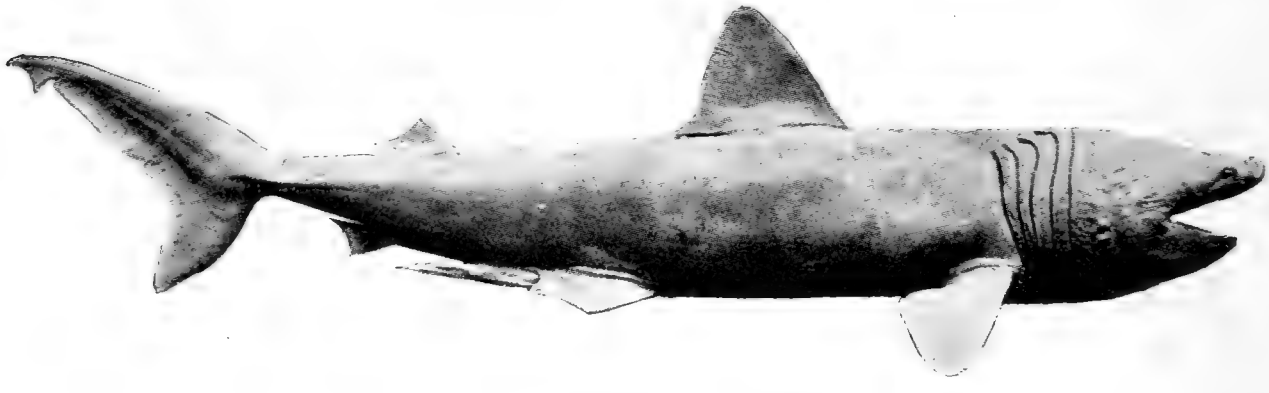


Fig. 29. *Cetorhinus maximus.*

The cast specimen in the S.A. Museum, of which the illustration is a photograph, is over twenty-five feet in length; the species is said to attain to nearly forty feet. The gill-slits extend from the top of the head to the throat, and the gill-rakers act as do the blades of baleen in the whalebone whales, straining from the water the small animals upon which they similarly feed.

FAMILY SQUALIDAE.

SQUALUS Linnaeus, 1758 (acanthias).

SQUALUS FERNANDINUS Molina (Spiny Dogfish).

Squalus fernandinus Moll., Saggio sulla storia Nat. Chili, 1782, p. 229; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 195 (syn.).

Acanthias blainvillii and *A. megalops* Macl., P.L.S., N.S.W., vi, 1881, p. 367.

Squalus megalops Waite, Rec. Aust. Mus., iv, 1901, p. 33, pl. iv, fig. 2 (foetus).

Acanthias vulgaris McCoy, Prod. Zool. Vict., dec. viii, 1883, pl. lxxv (not Risso).

Fig. 30. *Squalus fernandinus.*

The young are born alive, and to provide against laceration of the membranes of the mother by the sharp spines in front of the dorsal fins, each is, before birth, covered with a little knob.

The sharks of the Squalidae and following Families have no anal fin.

ACANTHIDIUM Lowe, 1839 (pusillum).

ACANTHIDIUM QUADRISPINOSUM McCulloch (Long-snouted Dogfish).

Acanthidium quadrispinosum McCull., Endeavour Res., iii, 1915, p. 100, pl. xiv, fig. 5-8.

Fig. 31. *Acanthidium quadrispinosum.*

Found in deep water in the Great Australian Bight and off Victoria.

OXYNOTUS Rafinesque, 1910 (centrina).

OXYNOTUS BRUNIENSIS Ogilby (Rough Shark).

Centrina salviana Hutt., T.N.Z. Inst., xxii, 1890, p. 276 (not Risso).
Centrina bruniensis Ogil., Rec. Aust. Mus., ii, 1893, p. 62.
Oxynotus bruniensis Waite, Rec. Cant. Mus., i, 1907, p. 8; McCull., Endeavour Res., ii, 1914, p. 80, pl. xiii.

Fig. 32. *Oxynotus bruniensis.*

A small ground shark with high triangular body and rough scales, each having five cusps.

FAMILY SCYMNORHINIDAE.

SCYMNORHINUS Bonaparte, 1846 (lichia = licha).

SCYMNORHINUS LICHA Bonnaterre.

Squalus licha Bonn., Encycl. Meth., Ichth., 1788, p. 12.
Dalatias lichia Gray, Chondropt., 1851, p. 75.
Scymnorhinus licha Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 236 (syn.); McCull., Endeavour Res., ii, 1914, p. 81, pl. xiv, fig. 1 and text fig. 1.

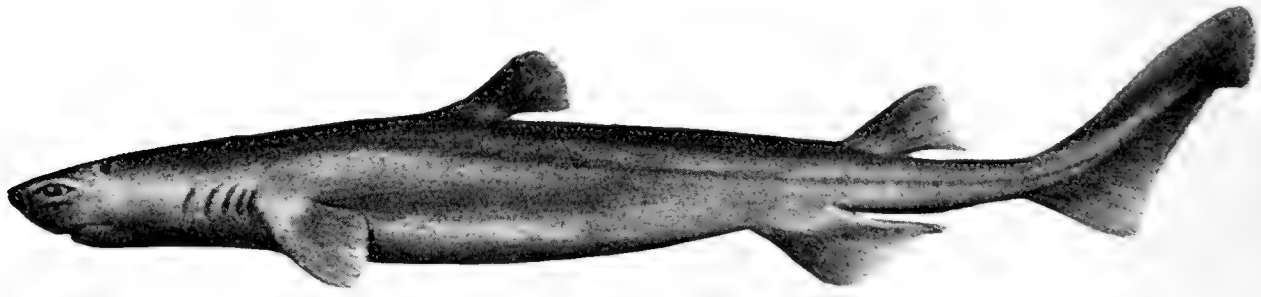


Fig. 33. *Scymnorhinus licha.*

This and the foregoing species *(Oxynotus bruniensis)* occur in the Great Australian Bight, also in New Zealand waters.

FAMILY PRISTIOPHORIDAE.

PRISTIOPHORUS Müller & Henle, 1837 (cirratus).

PRISTIOPHORUS CIRRATUS Latham (Saw Shark).

Pristis cirratus Lath., T.L.S., ii, 1794, p. 281, pl. xxvi, fig. 5 (saw) and xxvii.
Pristiophorus cirratus Müll. & Henle, Arch. f. Naturg., iii, 1837, and Plagiost., 1838, p. 98.

The little saw sharks, of which we have two species, are not to be confounded with the sawfishes *(Pristis)*, the latter being rays, not sharks, and not, so far, recorded from South Australia.

PRISTIOPHORUS NUDIPINNIS Günther (Saw Shark).

Pristiophorus nudipinnis Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 432; McCoy, Prod. Zool. Vict., dec. vi, 1881, pl. lvi, fig. 2; McCull., Endeavour Res., i, 1911, p. 10, pl. i, fig. 2.

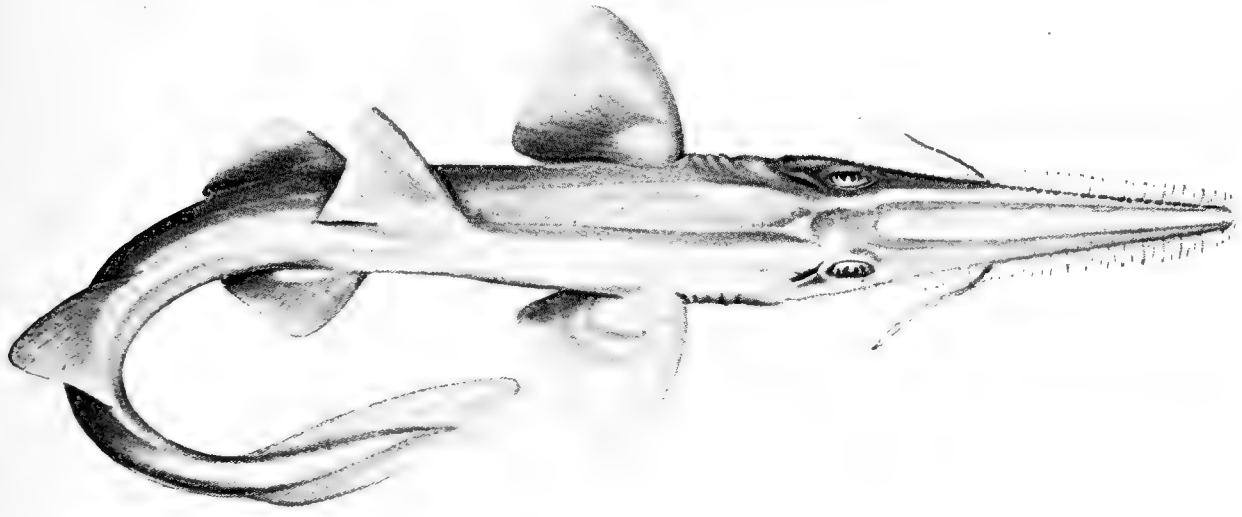


Fig. 35. *Pristiophorus nudipinnis.*

The teeth in the saw are not developed at the expense of the true teeth, which arm the mouth. The young are born alive, and until birth the saw teeth are folded against the blade and so prevent injury to the parent.

FAMILY SQUATINIDAE.

SQUATINA Duméril, 1806 (squatina).

SQUATINA AUSTRALIS Regan (Angel Shark).

Rhina squatina McCoy, Prod. Zool. Vict., dec. iv, 1879, pl. xxxiv (not Linn.).
Squatina squatina Waite, Mem. Aust. Mus., iv, 1899, p. 37.
Squatina australis Regan, Ann. Mag. Nat. Hist. (ser. 7), xviii, 1906, p. 438.

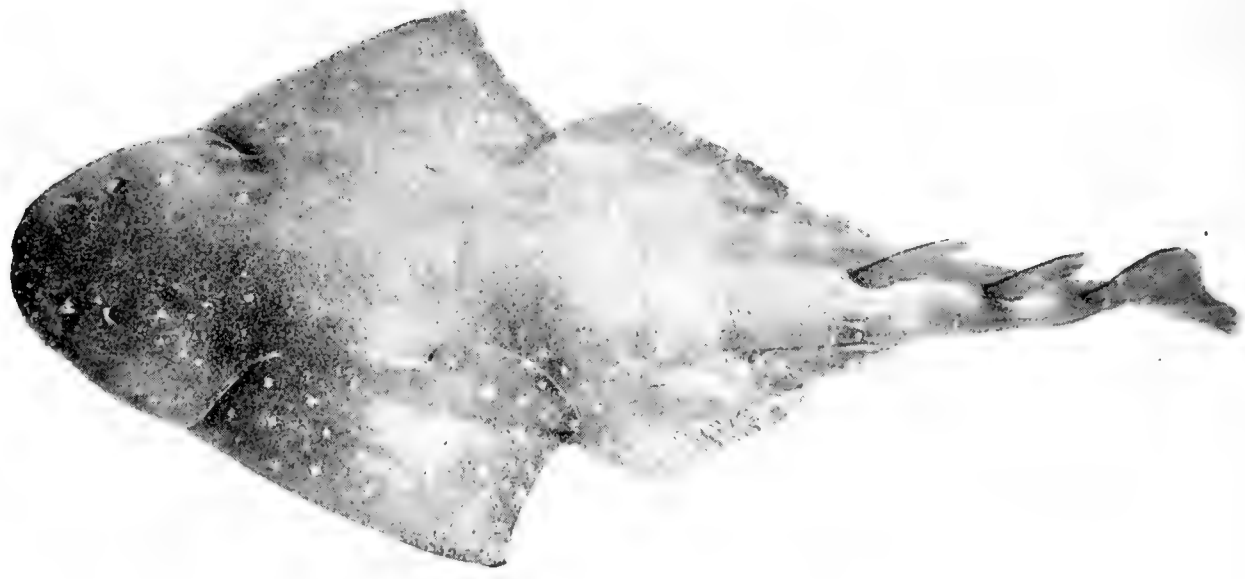


Fig. 36. *Squatina australis.*

Though classed with the sharks, the general features ally it rather with the rays; the broad flattened body, the small dorsal fins and their backward position, the slender tail and character of the vertebrae, are all ray-like; the lateral position of the gill-slits indicates affinities with the sharks. It is, in fact, a transitional form.

SQUATINA TERGOCELLATA McCulloch (Large-spotted Angel Shark).

Squatina tergocellata McCull., Endeavour Res., ii, 1914, p. 84, pl. xv, and text fig. 2.

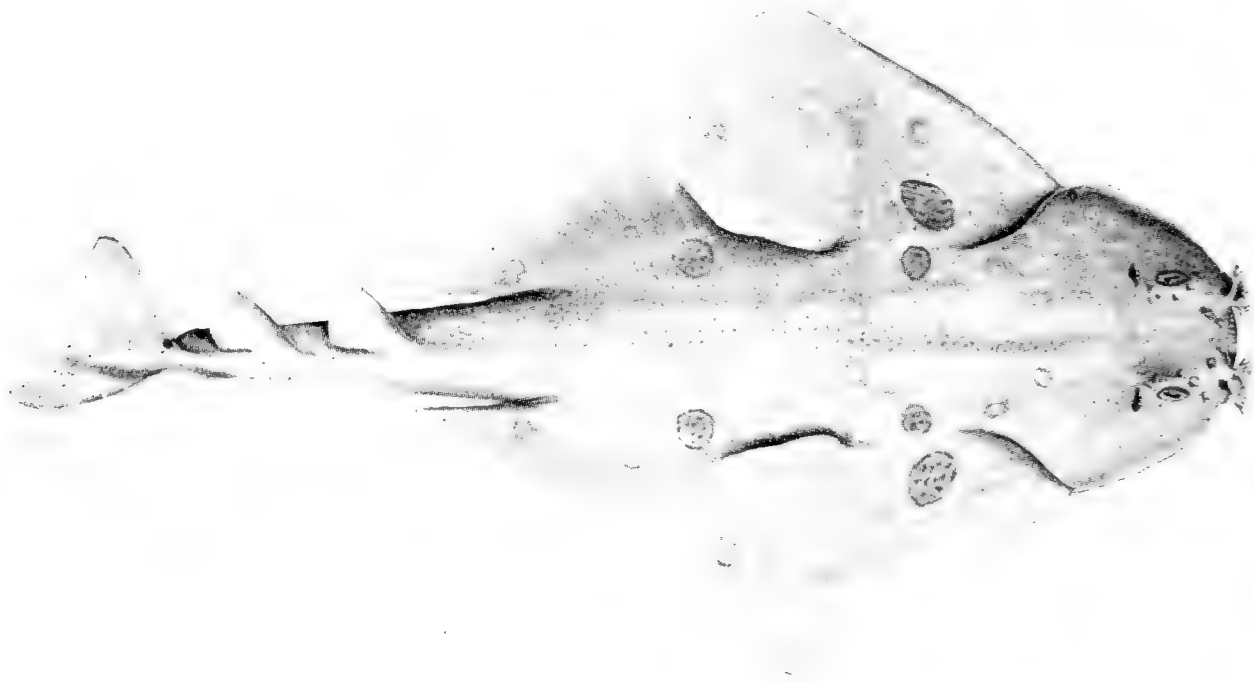


Fig. 37. *Squatina tergocellata.*

Known from a single specimen, taken in the Great Australian Bight.

ORDER BATOIDEI (RAYS).

FAMILY RHINOBATIDAE.

RHINOBATUS Bloch & Schneider, 1801 (rhinobatus).

RHINOBATUS PHILIPPI Müller & Henle (Shovel-nosed Ray).

Rhinobatus philippi Müll. & Henle, Plagiost., 1838, p. 119, pl. xxxix; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 278.

Rhinobatus banksii Müll. & Henle, Plagiost., 1838, p. 123, 192; Waite, Mem. Aust. Mus., iv, 1899, p. 38, pl. iii.

Rhinobates vincentianus Haacke, Zool. Anz., viii, 1885, p. 508.

Rhinobatus bougainvillei Ogil., P.L.S., N.S.W., x, 1886, p. 464.

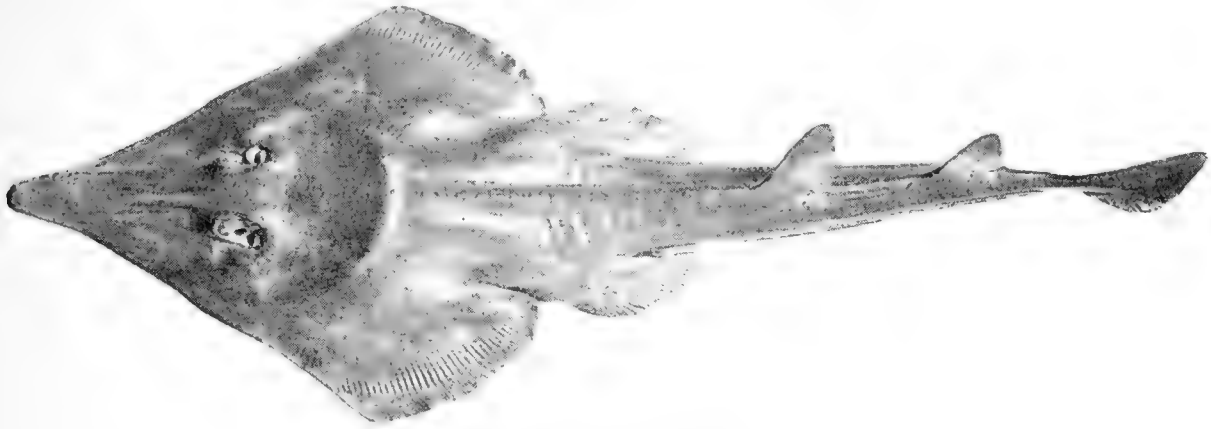


Fig. 38. *Rhinobatus philippi.*

Unlike the skates, the rays of this Family hatch the eggs within the body; the young are thus born alive and active.

TRIGONORRHINA Müller & Henle, 1838 (fasciata).

TRIGONORRHINA FASCIATA Müller & Henle (Fiddler).

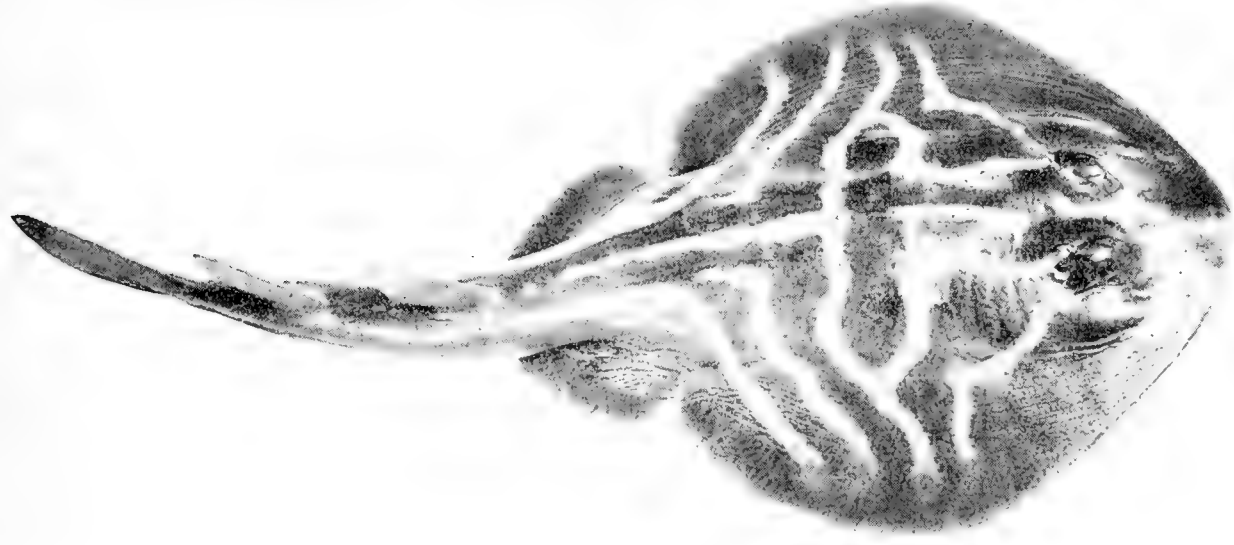


Fig. 39. *Trigonorrhina fasciata.*

Trigonorrhina fasciata Müll. & Henle, Mag. Nat. Hist. (2), ii, 1837, p. 90 and Plagiost., 1838, p. 124, pl. xliii.

Extremely common; a frequenter of shallow water, where it cruises around the jetties in search of food which is harboured by the piles.

FAMILY NARCOBATIDAE.

NARCOBATUS Blainville, 1816 (torpedo).

NARCOBATUS FAIRCHILDI Hutton (Southern Numbfish).

Torpedo fairchildi Hutt., Cat. Fish. N.Z., 1872, p. 83, pl. xii, fig. 134; McCull., Rec. Aust. Mus., xii, 1919, p. 171, pl. xxv.
Torpedo fusca Parker, T.N.Z. Inst., xvi, 1884, p. 283, pl. xxii.
Narcacion fairchildi Waite, Rec. Cant. Mus., i, 1909, p. 144, pl. xvii.

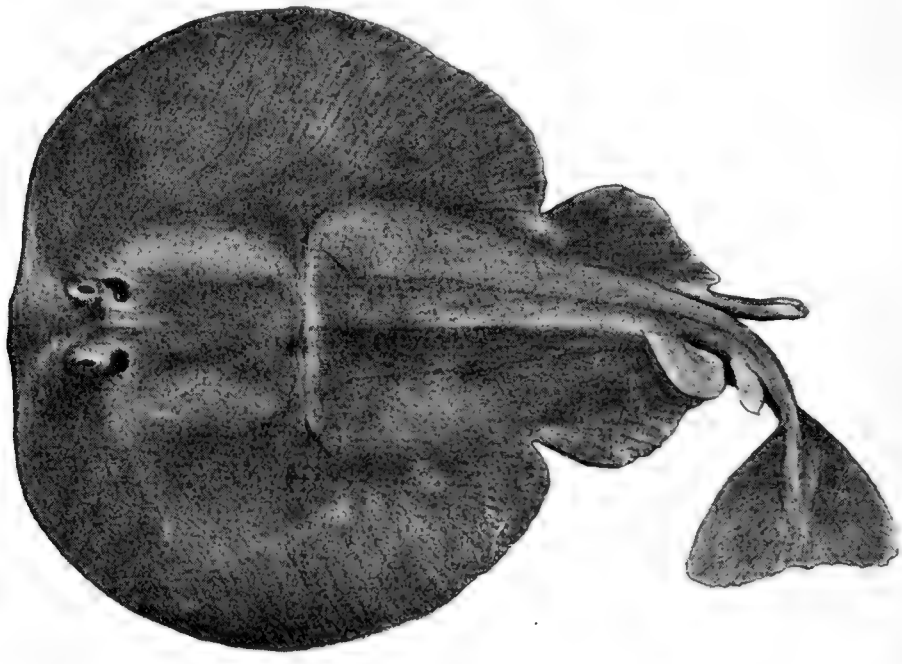


Fig. 40. *Narcobatus fairchildi.*

Frequents deeper water than the foregoing, and its range extends to the south of New Zealand.

HYPNARCE Waite, 1902 (subnigra).

HYPNARCE SUBNIGRA Duméril (Numbfish).

Hypnos subnigrum Dum., Rev. Mag. Zool. (2), iv, 1852, p. 279, pl. xii.
Hypnarce subnigra Waite, Rec. Aust. Mus., iv, 1902, p. 180.

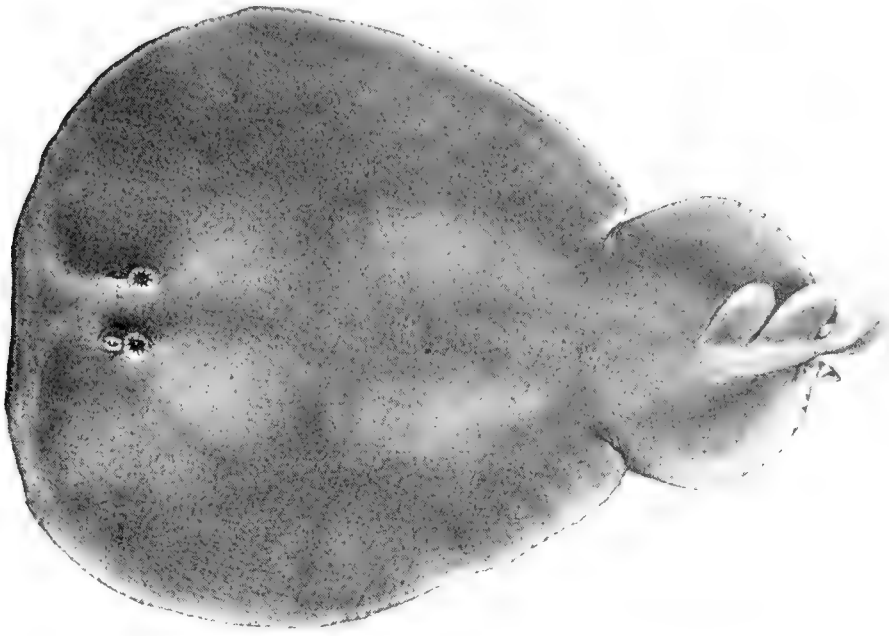


Fig. 41. *Hypnarce subnigra.*

The larger forms of the family of electric rays are capable of giving very powerful shocks. This species attains to over two feet in length and, in our waters, is subject to peculiar distortion, which greatly changes its appearance.

FAMILY RAJIDAE.

RAJA Linnaeus, 1758 (batis).

RAJA LEMPRIERI Richardson (Skate).

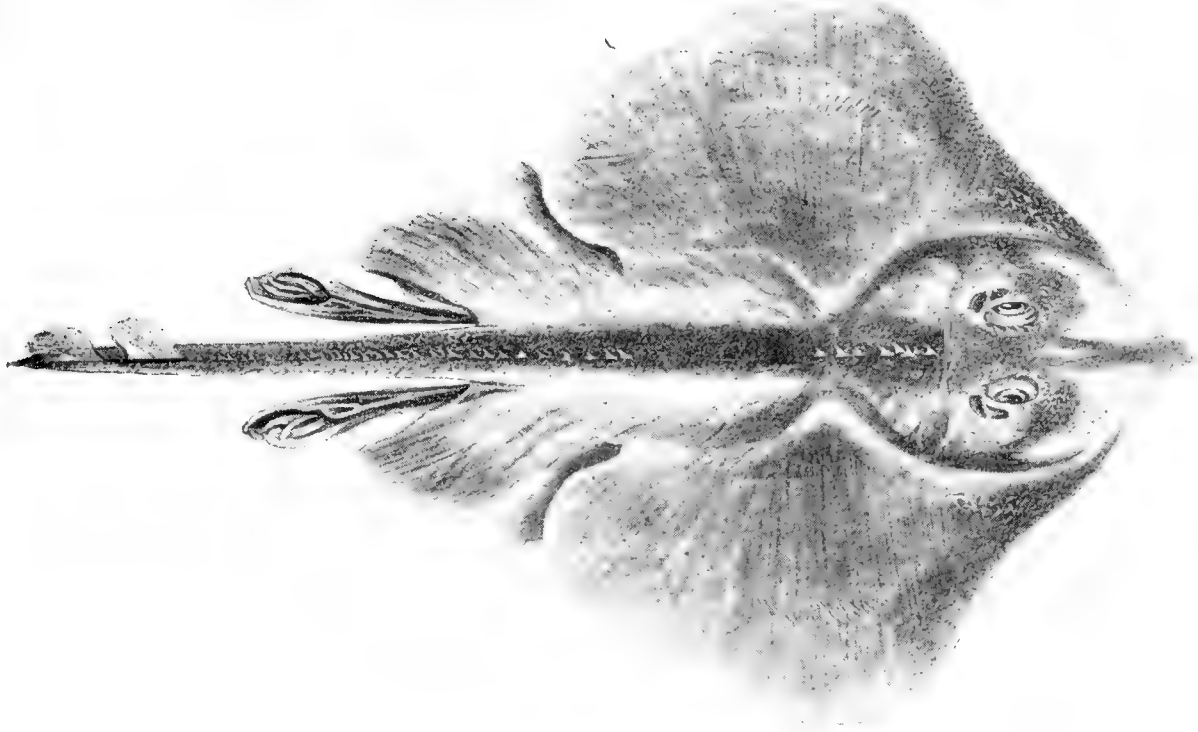


Fig. 42. *Raja lemprieri.*

Raia lemprieri Rich., Zool. Ereb. & Terr., 1845, p. 34, pl. xxiii.

Raja dentata Klunz., Arch. f. Naturg., xxxviii, 1872, p. 46.

Raja australis Macl., P.L.S., N.S.W., viii, 1884, p. 461; Waite, Mem. Aust. Mus., iv, 1899, p. 40, pl. iv.

In other countries skates are used as food. The eggs are laid in four-cornered cases, the familiar "Skate-barrows."

PSAMMOBATIS Günther, 1870 (rudis).

PSAMMOBATIS WAITII McCulloch (Round Ray).

Raja waitii McCull., Endeavour Res., i., 1911, p. 12, pl. iii, and text fig. 4.

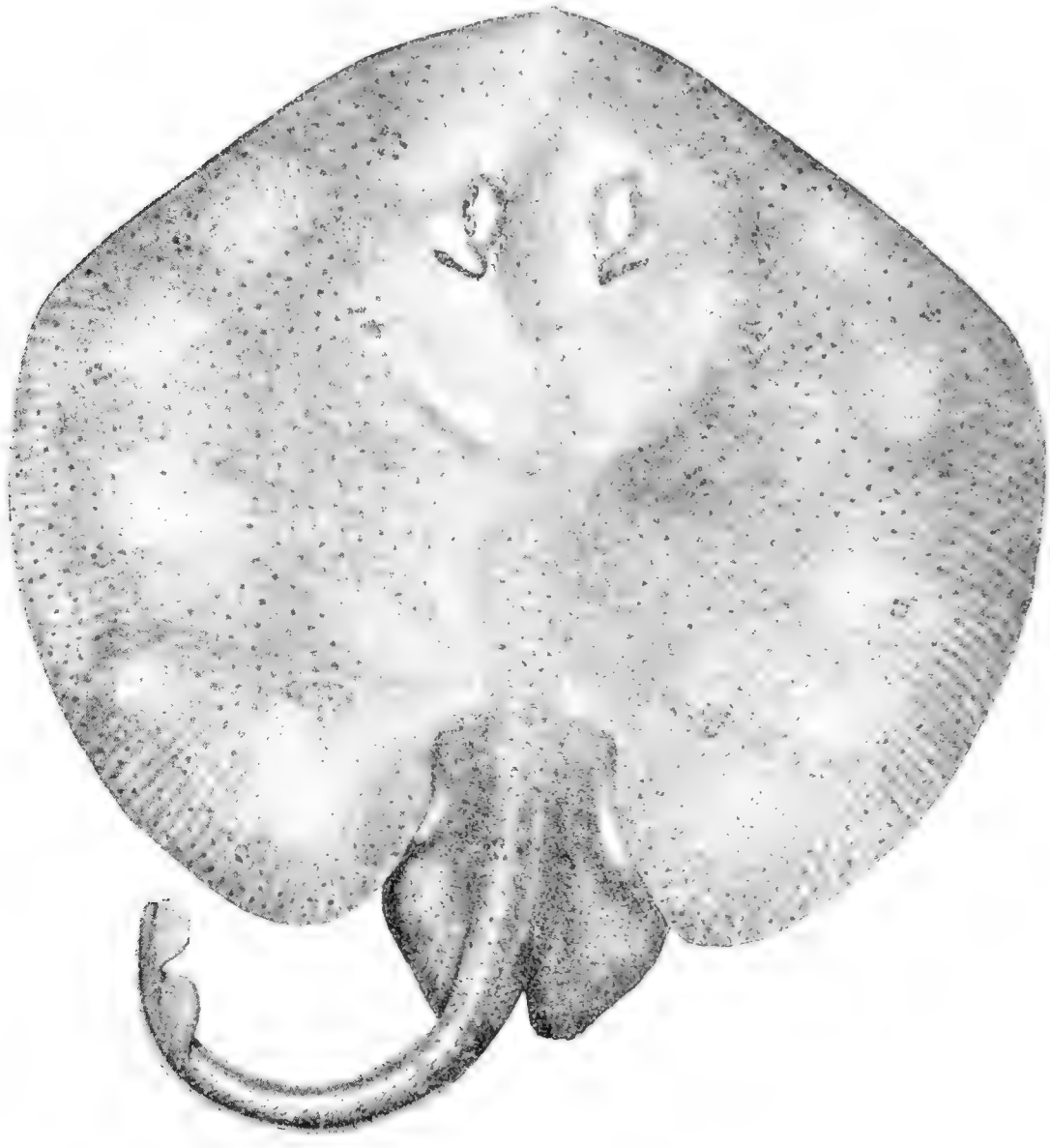


Fig. 43. *Psammobatis waitii.*

Remarkable for its almost circular shape and smooth skin. It is known only from a single specimen, taken off Greenly Island, South Australia.

FAMILY DASYATIDAE.

DASYATIS Rafinesque, 1810 (pastinacus).

DASYATIS BREVICAUDATUS Hutton (Stingray).

Trygon brevicaudata Hutt., Ann. Mag. Nat. Hist. (4), xvi, 1875, p. 317.
Dasybatus brevicaudatus Waite, Rec. Cant. Mus., i, 1909, p. 151, pl. xxii.
Dasyatis brevicaudatus McCull., Endeavour Res., iii., 1915, p. 102, pl. xv, fig. 1 and xvii, fig. 1.

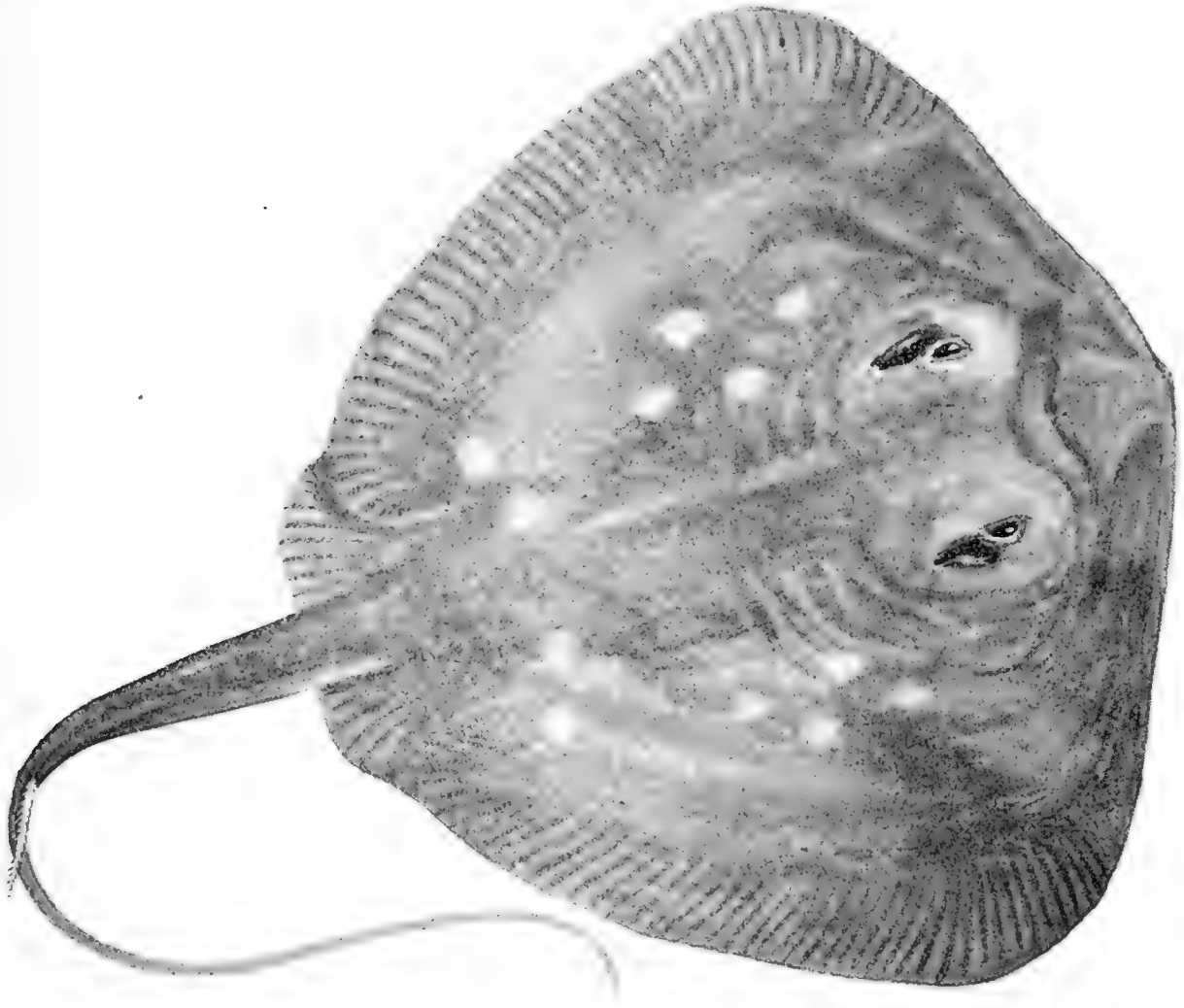


Fig. 44. *Dasyatis brevicaudatus.*

This species was described from a mutilated example, hence the unfortunate name *(brevicaudatus).* The large dark object seen gliding along the bottom in the deeper water off Kangaroo Island is doubtless this Stingray.

UROLOPHUS Müller & Henle, 1837 (cruciatus).

UROLOPHUS CRUCIATUS Lacepède (Banded Stingaree).

Raja cruciata Lacep., Ann. Mus. Hist. Nat., iv, 1804, p. 201, 210, pl. lv, fig. 2.
Leiobatus cruciatus Blainv., Bull. Soc. Philom., 1816, p. 121.
Urolophus ephippiatus Rich., Zool. Ereb. & Terr., 1845, p. 35, pl. xxiv.
Urolophus cruciatus, Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 485; McCull., Endeavour Res., iv, 1916, p. 171.

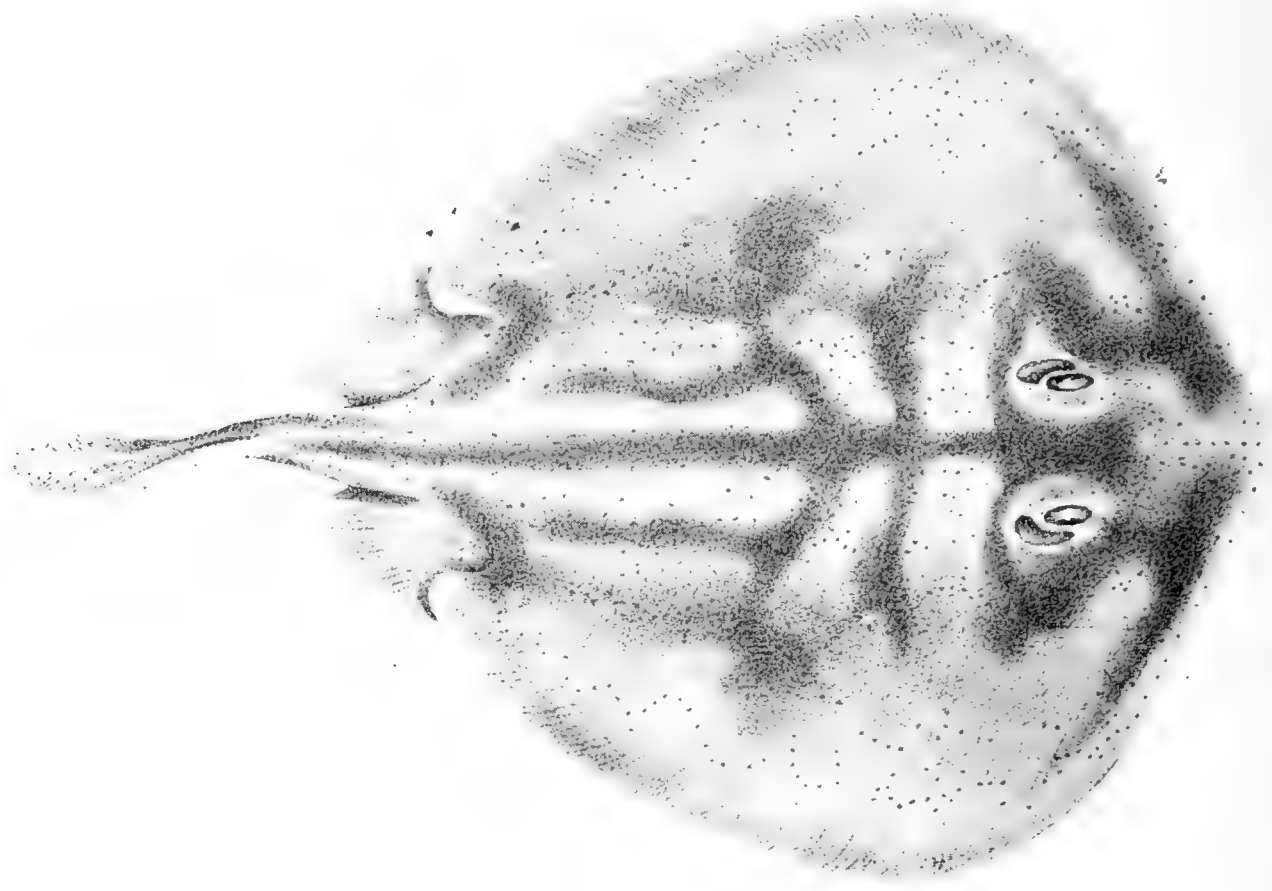


Fig. 45. *Urolophus cruciatus.*

Stingaree is the name assigned to the smaller forms, in which the tail is of moderate length and provided with an expanded fin. The larger rays, with a long whip-like tail, are called Stingrays, though the nomenclature is not observed throughout Australia. The Banded Stingaree is a deep-water form, hence the species generally taken by trawling.

UROLOPHUS TESTACEUS Müller & Henle (Stingaree).

Trygonoptera testacea Müll. & Henle, Plagiost., 1838, p. 174, pl. lvii.
Urolophus testaceus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 486; McCull., Endeavour Res., iv, 1916, p. 174, pl. l.
Trygon testacea Zietz, T.R.S., S.A., xxxii, 1908, p. 292.

Trygonoptera mullerii, *T. henlei* and *T. australis*, Steind., Sitzb. Akad. Wiss. Wien, lxxx, 1866, p. 479, 480, pl. vi, fig. 4, 5 and pl. vii.

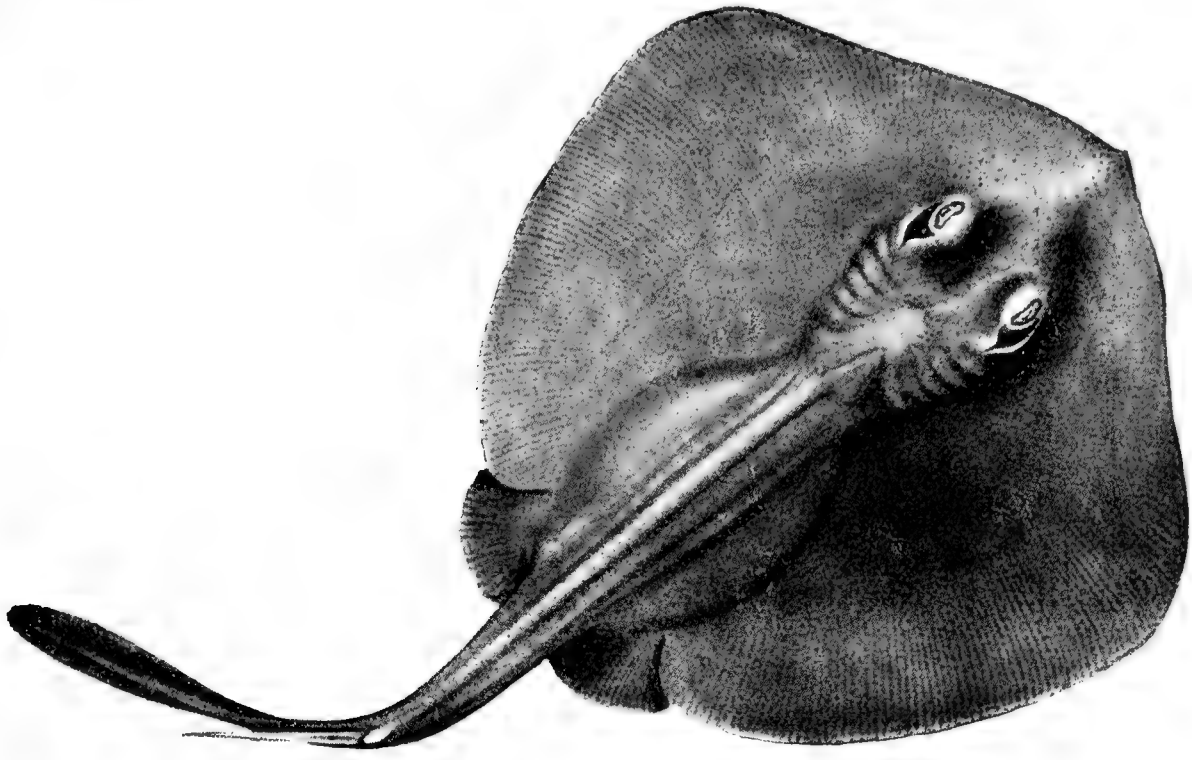


Fig. 46. *Urolophus testaceus.*

Common in shallow water. There is no poison sac in connection with the tail-spines of the Stingarees, but the spines make jagged and painful wounds.

UROLOPHUS EXPANSUS McCulloch (Broad-backed Stingaree).

Urolophus expansus McCull., Endeavour Res., iv, 1916, p. 178, fig. 2.

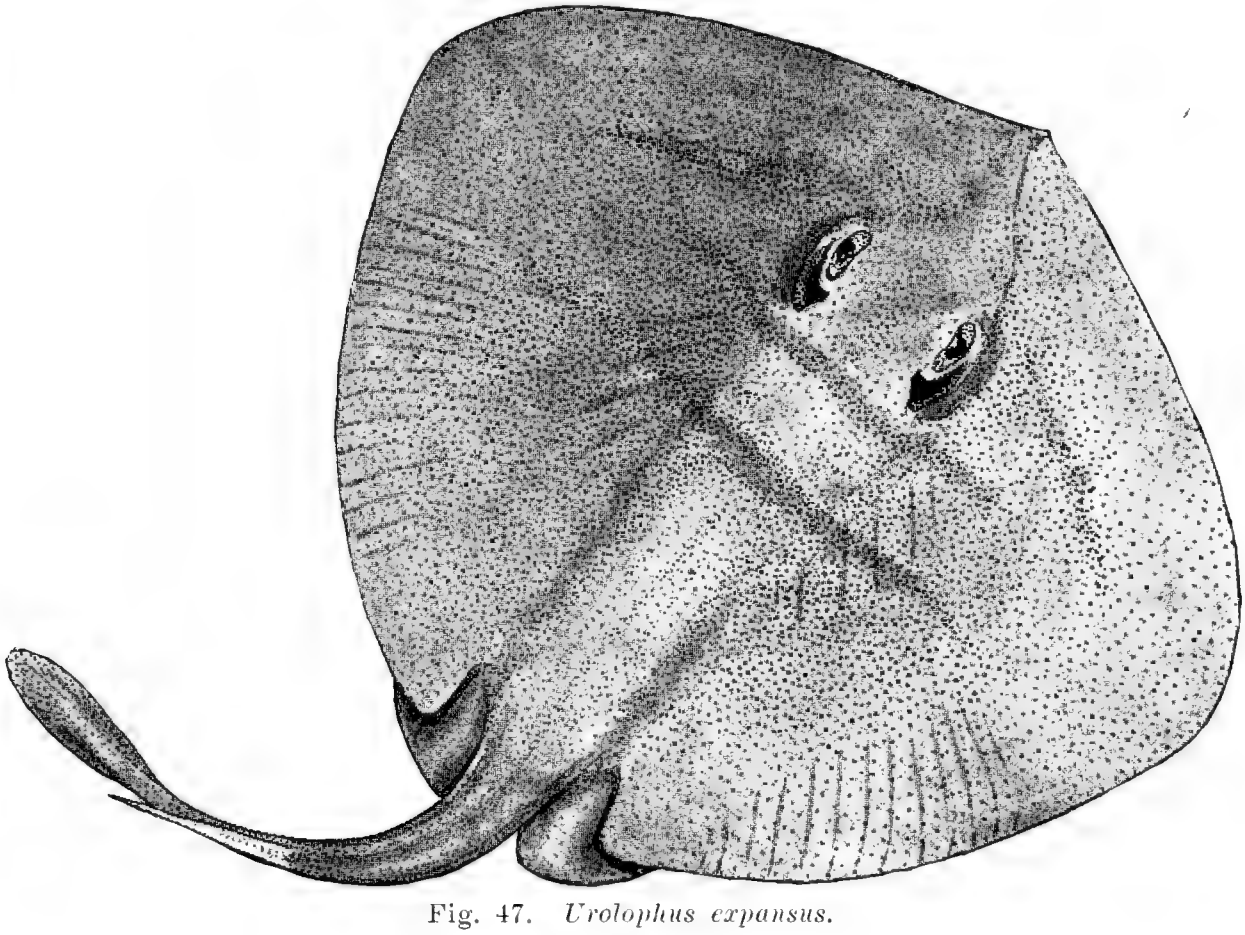


Fig. 47. *Urolophus expansus.*

Taken in the Great Australian Bight, 80-120 fathoms.

FAMILY MYLIOBATIDAE.

MYLIOBATIS Cuvier, 1817 (aquila).

MYLIOBATIS TENUICAUDATUS Hector (Eagle Ray).

Myliobatis tenuicaudatus Hect., T.N.Z. Inst., ix, 1877, p. 468; Garm., Mem. Mus. Comp. Zool., xxxvi, 1913, p. 433.

Myliobatis australis Macl., P.L.S., N.S.W., vi, 1881, p. 380; McCoy, Prod. Zool. Viet., dec. vii, 1882, pl. lxiii.

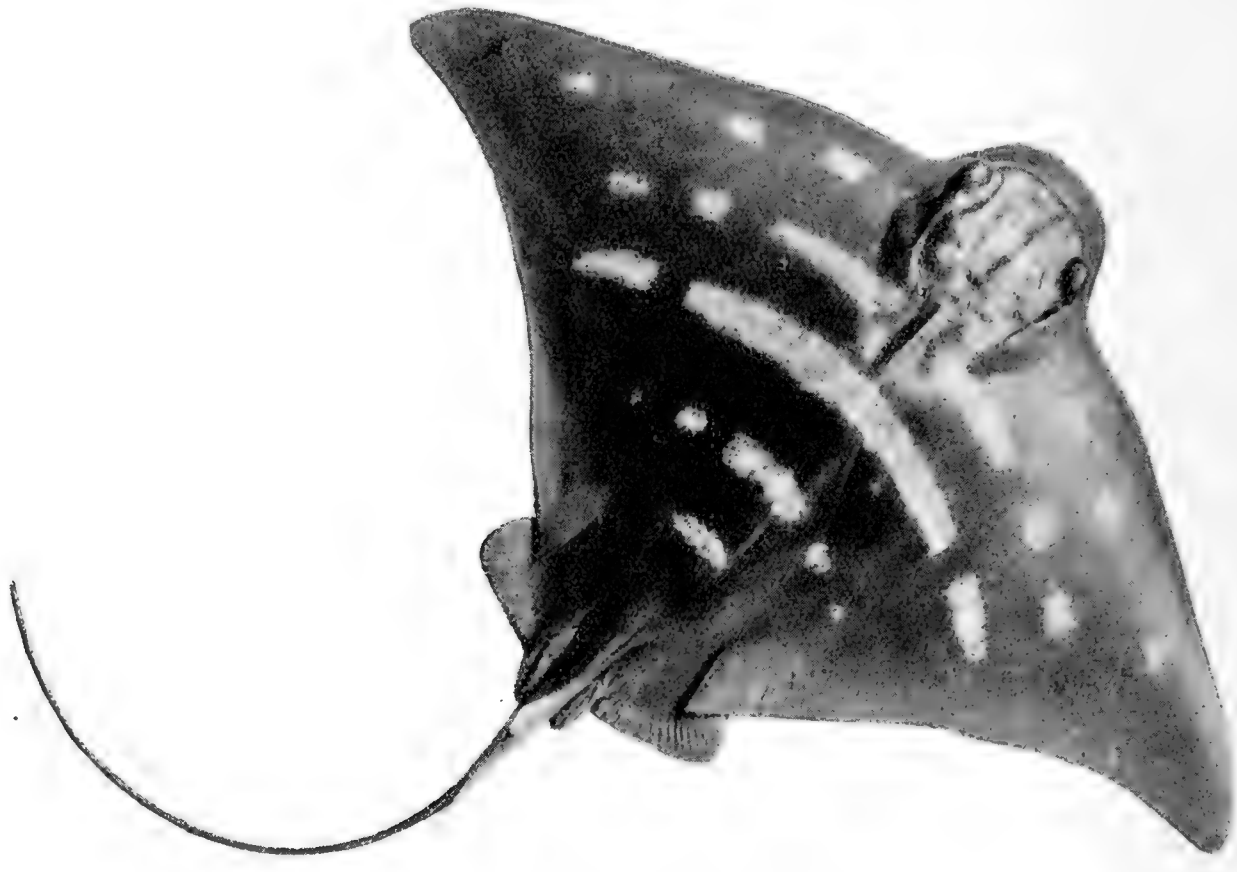


Fig. 48. *Myliobatis tenuicaudatus.*

Crushes shells with its flat pavement-like teeth, whence it is also called Mill Ray.

SUB-CLASS HOLOCEPHALI.

FAMILY CALLORHYNCHIDAE.

CALLORHYNCHUS Cuvier, 1817 (callorhynchus).

CALLORHYNCHUS MILII Bory (Elephant Shark).

Callorhynchus milii Bory, Dict. Class. Hist. Nat., iii, 1823, p. 62, pl. v; Garm., Bull. Mus. Comp. Zool., xli, 1904, p. 266, pl. vi, fig. 7-8 (teeth) and xv, fig. 4, 5 (brain).

Callorhynchus antarcticus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 351 (part); McCoy, Prod. Zool. Vict., dec. xii, 1886, pl. cxii.

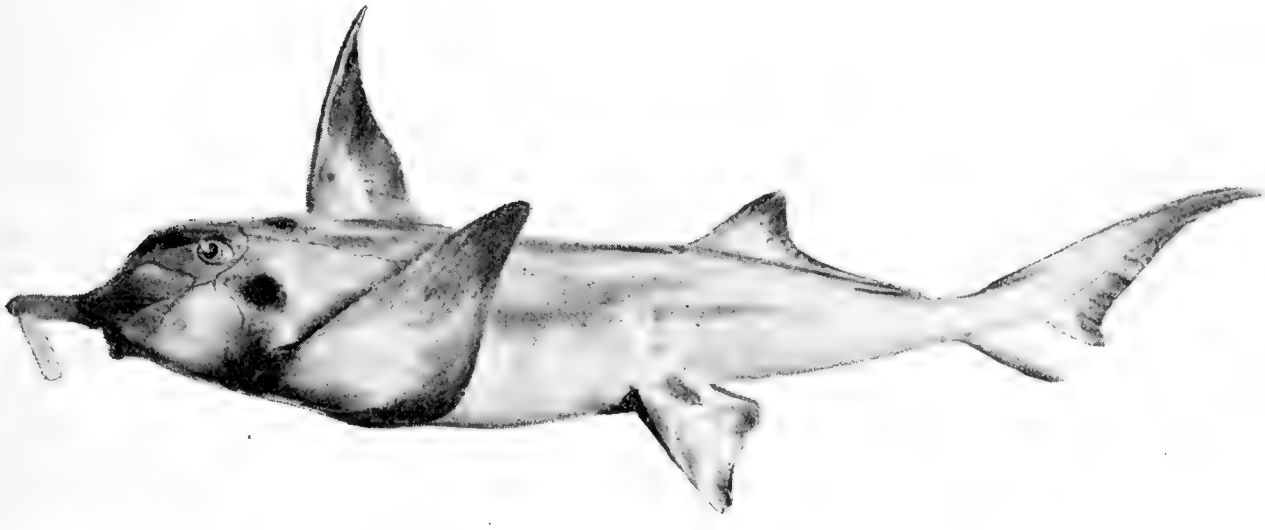


Fig. 49. *Callorhynchus milii.*

The quaint forms of the Sub-class *Holocephali* have a single external gill-slit and a depressible dorsal spine. In the Port Jackson Sharks and the Spiny Dogfishes, the spines are fixed in erect position and precede both dorsal fins.

SUB-CLASS TELEOSTOMI (BONY FISHES).

ORDER ISOSPONDYLI.

FAMILY ENGRAULIDAE.

ENGRAULIS Cuvier, 1817 (encrasicholus).

ENGRAULIS AUSTRALIS Shaw (Anchovy).

Atherina australis Shaw, in White's Voy. N.S.W., 1790, p. 296, pl. lxiv, fig. 1.

Engraulis australis McCoy, Off. Rec. Interc. Exhib. Melb., 1866, p. 319; McCull., Rec. Aust. Mus., xiii, 1920, p. 43, pl. xii, fig. 1 (ref.).
Engraulis antipodum Günth., Cat. Fish. Brit. Mus., vii, 1868, p. 386.
Engraulis antarcticus Cast., P.Z.S. Vict., i, 1872, p. 186.

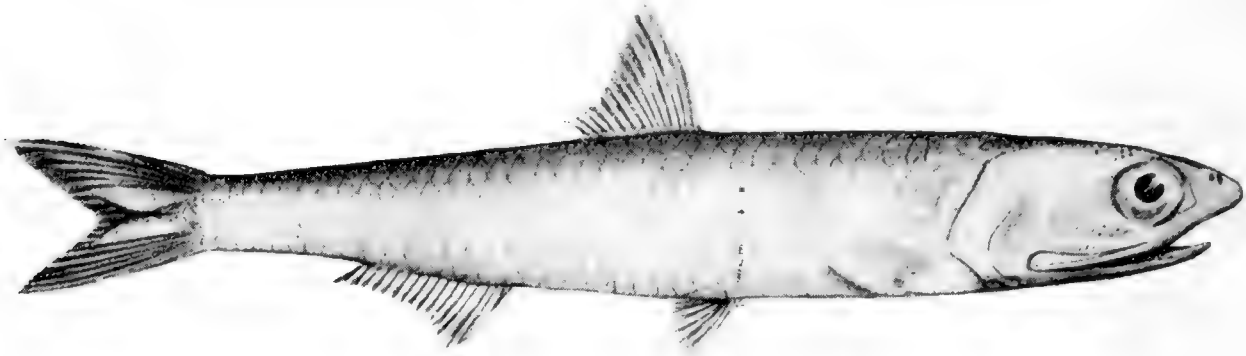


Fig. 50. *Engraulis australis.*

Occasionally reported as occurring in immense shoals off Eastern and Victorian coasts. Has been similarly recorded here, but systematic observations are needed, only possible when a fisheries bureau is instituted on a scientific basis. Anchovies are valuable economic fishes.

FAMILY CLUPEIDAE.

ETRUMEUS Bleeker, 1853 (micropus).

ETRUMEUS JACKSONIENSIS Macleay (Maray).

Etrumeus jacksoniensis Macl., P.L.S., N.S.W., iii, 1878, p. 36, pl. iv, fig. 1 and iv, 1879, p. 382; Ogil., Edib. Fish. N.S.W., 1893, p. 186; McCull., Rec. W.A. Mus., i, 1914, p. 211, pl. xxix.

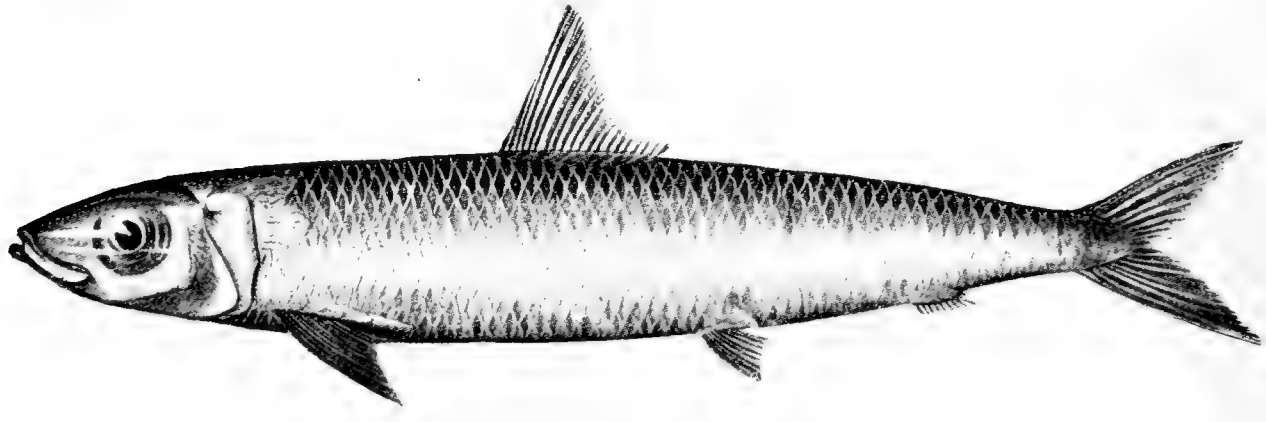


Fig. 51. *Etrumeus jacksoniensis.*

Like the Pilchard, occurs in great shoals: it is somewhat similar to that fish but can be at once distinguished by the round smooth belly, from which character the name "Round Herrings" is applied to members of this genus.

CLUPEA Linnaeus, 1758 (harengus).

CLUPEA BASSENSIS McCulloch (Sprat).

Clupea sprattus Günth., P.Z.S., 1871, p. 672 (not Linn.).
Clupea bassensis McCull., Endeavour Res., i, 1911, p. 16, pl. iv, fig. 2.

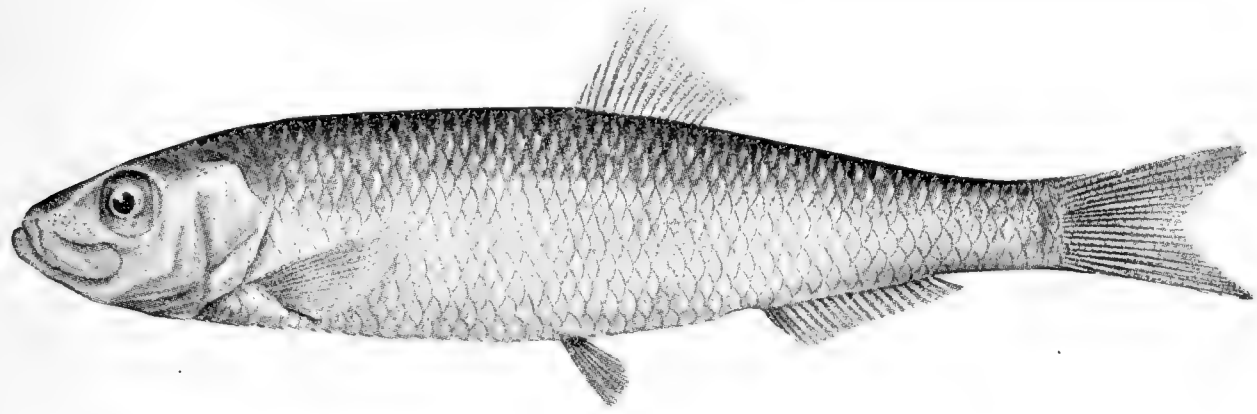


Fig. 52. *Clupea bassensis.*

Scarcely distinguishable from the European Sprat, but not commercially netted.

SARDINIA Poey, 1860 (pseudohispanica).

SARDINIA NEOPILCHARDA Steindachner (Pilchard).

Clupea neopilchardus Steind., Denk. Akad. Wien., xli, 1879, p. 12.
Clupea sagax Cast., P.Z.S., Viet., i, 1872, p. 187; Ogil., Edib. Fish. N.S.W., 1893, p. 180, pl. xlv.
Clupanodon neopilchardus Waite, Mem. Aust. Mus., iv, 1899, p. 53; Stead, Edib. Fish. N.S.W., 1908, p. 25, pl. iv; McCull., Endeavour Res., i, 1911, p. 17; Roughley, Fish. Aust., 1916, p. 30.
Amblygaster neopilchardus Waite, Aust. Antarct. Exped. Fishes, iii, 1916, p. 56.
Sardina neopilchardus Regan, A.M.N.H. (8), xviii, 1916, p. 14, pl. i, fig. 2.

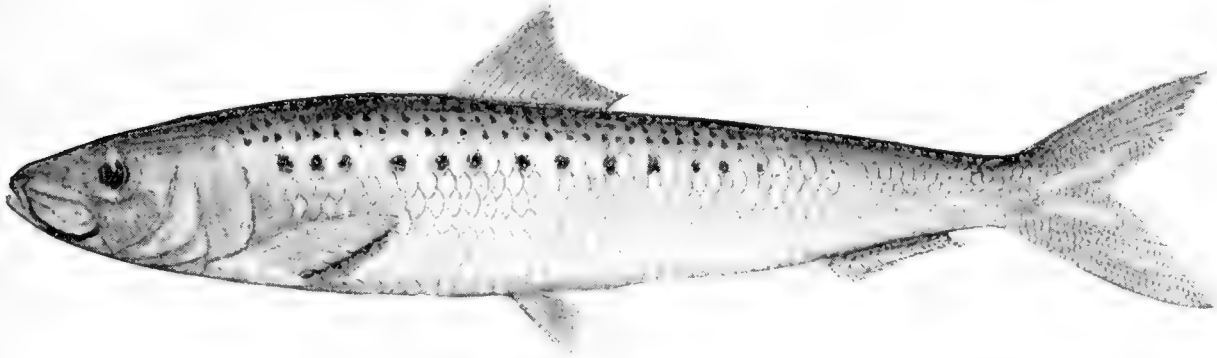


Fig. 53. *Sardinia neopilcharda.*

Said to visit Australian shores every winter in countless myriads, and destined some day to become an important source of food. In Europe young

Pilchards are the familiar Sardines. In America Pilchards of any age are called Sardines. These and allied fishes differ from the "Round Herrings" in having the belly sharp and rough to the touch.

DOROSOMA Rafinesque, 1820 (heterura).

DOROSOMA COME Richardson (Bony Bream, Tukari).

Chatoessus come Rich., Zool. Ereb. & Terr., ii, 1845, p. 62, pl. xxxviii, fig. 7-10.
Chatoessus erebi Günth., Cat. Fish. Brit. Mus., vii, 1868, p. 407; Cast., P.Z.S., Vict., i, 1872, p. 184.
Chatoessus richardsoni Cast., *op. cit.*, ii, 1873, p. 144; Ogil., Edib. Fish. N.S.W., 1893, p. 178.
Chatoessus horni Zietz, Rep. Horn Exped., ii, 1896, p. 180, pl. xvi, fig. 6.
Dorosoma nasus Stead, Edib. Fish. N.S.W., 1908, p. 24, pl. iii.

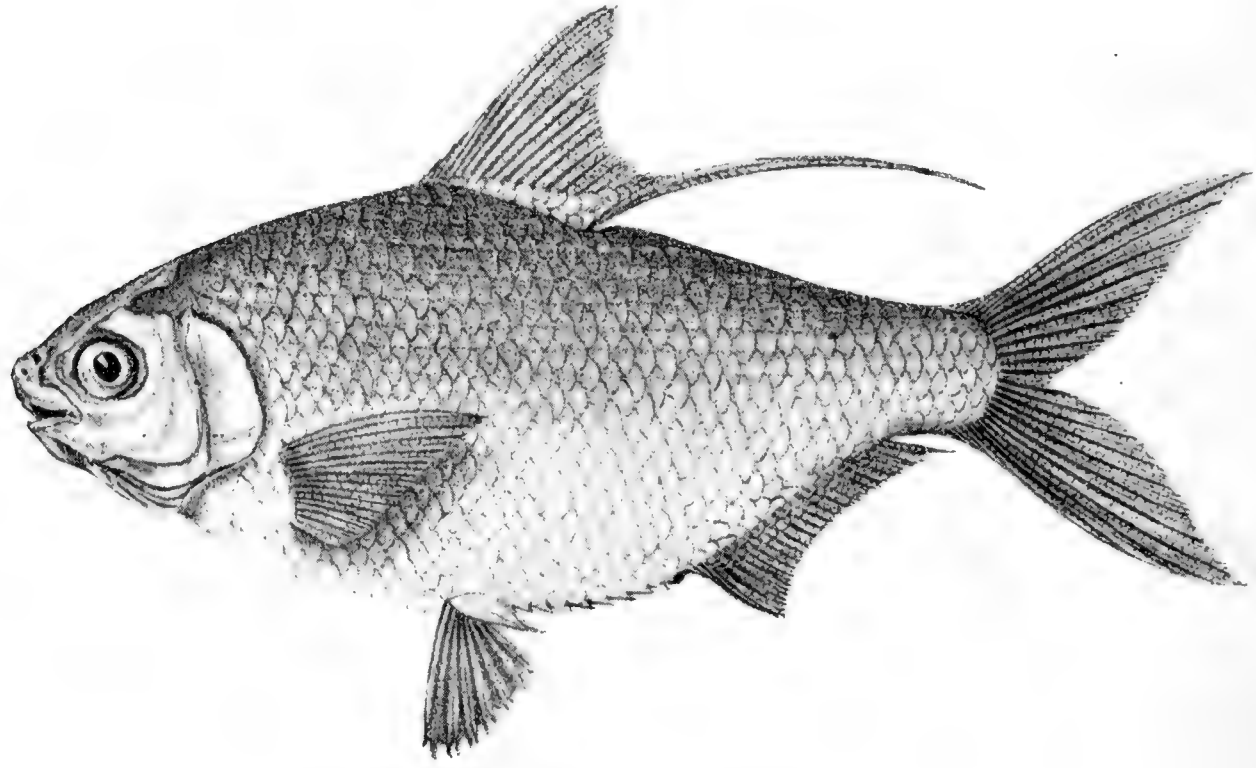


Fig. 54. *Dorosoma come.*

Too bony to be appreciated as food, but the objectionable feature may be largely overcome by sousing the fish in vinegar.

STOLEPHORUS Lacepède, 1803 (japonicus).

STOLEPHORUS ROBUSTUS Ogilby (Blue Sprat).

Spratelloides robustus Ogil., P.L.S., N.S.W., xxii, 1898, p. 64.

Stolephorus robustus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 12 and Rec. Aust. Mus., vi, 1906, p. 195; McCull., Rec. Aust. Mus., xiii, 1920, p. 42, pl. xi, fig 1.

Spratelloides delicatulus Zietz, T.R.S., S.A., xxxii, 1908, p. 295 (not Benn.).

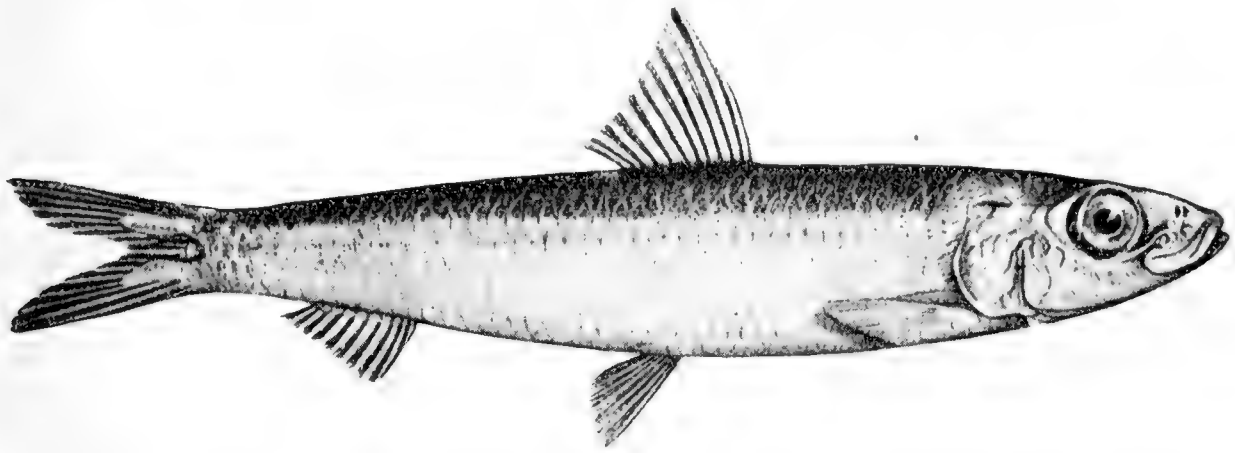


Fig. 55. *Stolephorus robustus.*

An excellent little food fish, but not more than four inches long. Differs from the next species in having the back and belly smooth.

HYPERLOPHUS Ogilby, 1893 (spratellides=vittatus).

HYPERLOPHUS VITTATUS Castelnau (Rough-backed Sprat).

Meletta vittata Cast., Res. Fish. Aust., 1875, p. 46.

Clupea vittata Macl., P.L.S., N.S.W., iv, 1879, p. 379.

Clupea spratellides Ogil., Rec. Aust. Mus., ii, 1892, p. 24.

Diplomystus spratellides Ogil., Edib. Fish. N.S.W., 1893, p. 183.

Hyperlophus (Omochetus) copii Ogil., P.L.S., N.S.W., xxii, 1898, p. 72.

Hyperlophus vittatus McCull., Rec. Aust. Mus., xi, 1917, p. 163, pl. xxix, fig. 1, 2.

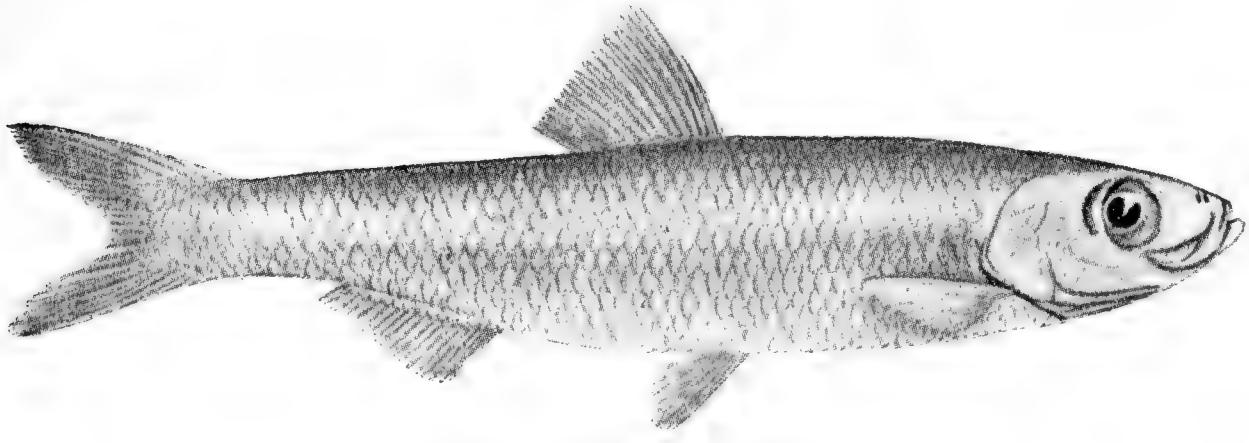


Fig. 56. *Hyperlophus vittatus.*

"A delicate and delicious little fish, destined to become the very finest sardine of commerce." The back and belly are both rough.

FAMILY GONORHYNCHIDAE.

GONORHYNCHUS Scopoli, 1777 (gonorhynchus).

GONORHYNCHUS GREYI Richardson (Sand Fish).

Rynchana greyi Rich., Zool. Ereb. & Terr., 1845, p. 44, pl. xxix, fig. 1-6 and text fig.

Gonorhynchus greyi Günth., Cat. Fish. Brit. Mus., vii, 1868, p. 373.

Gonorhynchus gonorynchus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 13; Stead, "Beaked Salmon," 1908, plate and text fig. (scale).

Gonorrynchus forsteri Ogil., Ann. Qld. Mus., x, 1911, p. 34.

Fig. 57. *Gonorhynchus greyi.*

A somewhat primitive marine fish, living on sandy stretches, but seldom seen; its body is almost circular in section; its flesh white, firm and good to eat. The undershot jaw is responsible for the name "Sand Shark"; it is also known as "Beaked Salmon."

FAMILY GALAXIIDAE.

GALAXIAS Cuvier, 1817 (truttaceus).

GALAXIAS ATTENUATUS Jenyns (Native trout, Pulangi).

Galaxias truttaceus Valenc., in Cuv., Ill. Règ. Anim., 1829, pl. xcvii, fig. 1 (not Cuv.).

Mesites attenuatus Jenyns, Zool. Beagle, iii, 1842, p. 121, pl. xxii, fig. 5.

Galaxias scriba and *G. attenuatus* Cuv. & Val., Hist. Nat. Poiss., xviii, 1846, p. 347, 348.

Galaxias maculatus Rich., Zool. Ereb. & Terr., 1848, p. 75, pl. xliii, fig. 14-17 (not Jenyns).

Galaxias minutus Philippi, Arch. f. Naturg., xxiv, 1858, p. 309.

Galaxias krefftii and *G. punctatus* Günth., Cat. Fish. Brit. Mus., vi, 1866, p. 211, 212.

Galaxias waterhousei Krefft, P.Z.S., 1867, p. 943.
Galaxias cylindricus and *G. delicatulus* Cast., P.Z.S., Viet., i, 1872, p. 177, 178.
Galaxias campbelli Sauv., Bull. Soc. Phil. (7), iv, 1880, p. 229.
Galaxias nebulosa Macl., P.L.S., N.S.W., vi, 1881, p. 234.
Austrocobitis attenuatus Ogil., P.L.S., N.S.W., xxiv, 1899, p. 158.
Galaxias alpinus (part) Smitt, Bih. Svenska Akad., xxvi (iv, 13), 1901, p. 21, pl. ii, fig. 9-12.
Galaxias attenuatus Regan, P.Z.S., 1906, p. 368, pl. xii, fig. 1 and xiii, fig. 2.

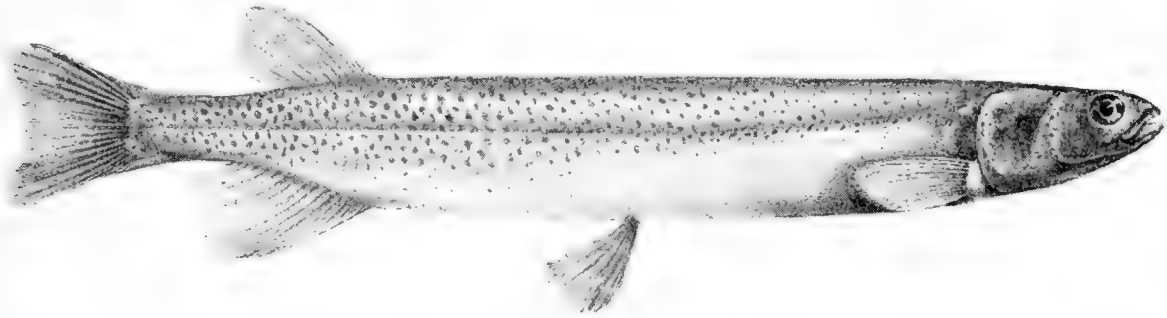


Fig. 58. *Galaxias attenuatus.*

Common in all our fresh-waters that run to the sea, where the species is believed to spawn. Has a very wide distribution in Southern seas, which circumstance is frequently advanced in support of the contention of a former Antarctic Continent. The young of this species, caught ascending the rivers, is the main constituent of the New Zealand "whitebait."

GALAXIAS OLIDUS Günther (Minnow).

Galaxias olidus Günth., Cat. Fish. Brit. Mus., vi, 1866, p. 209; Regan, P.Z.S., 1906, p. 381, pl. xi, fig. 3.
Galaxias schomburgkii Peters, Mon. Akad. Berl., 1868, p. 455; Regan, *op. cit.*, p. 382.
Galaxias kayi Rams. & Ogil., P.L.S., N.S.W. (2), i, 1887, p. 6.

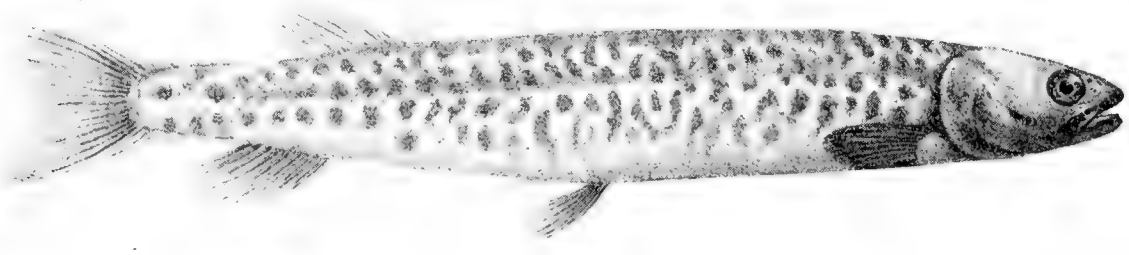


Fig. 59. *Galaxias olidus.*

Similar to the preceding but confined to fresh-water; is appreciated as a pan fish by picnickers. An excellent aquarium fish, but has, so far, not been bred in captivity.

GALAXIAS COXII Macleay (Mountain Trout).

Galaxias coxii Macl., P.L.S., N.S.W., v, 1880, p. 45; Ogil., Edib. Fish. N.S.W., 1893, p. 176; Regan, P.Z.S., 1906, p. 380, pl. xii, fig. 2; Zietz, T.R.S., S.A., xxxii, 1908, p. 297.

Galaxias n'gothoruk Lucas, P.R.S., Viet. (2), iv, 1892, p. 27.

Fig. 60. *Galaxias coxii.*

The occurrence of this species in South Australia is doubtful.

FAMILY ARGENTINIDAE.

ARGENTINA Linnaeus, 1758 (sphyraena).

ARGENTINA ELONGATA Hutton (Silverside).

Argentina elongata Hutt., A.M.N.H. (5), iii, 1879, p. 53; Günth., Chall. Rep., xxii, 1887, p. 218, pl. lv, fig. B; McCull., Endeavour Res., i, 1911, p. 18 and ii, 1914, p. 87; Waite, Rec. Cant. Mus., i, 1911, p. 161, pl. xxiv.

Argentina decagon Clarke, T.N.Z.I., xi, 1879, p. 296, pl. xiv.

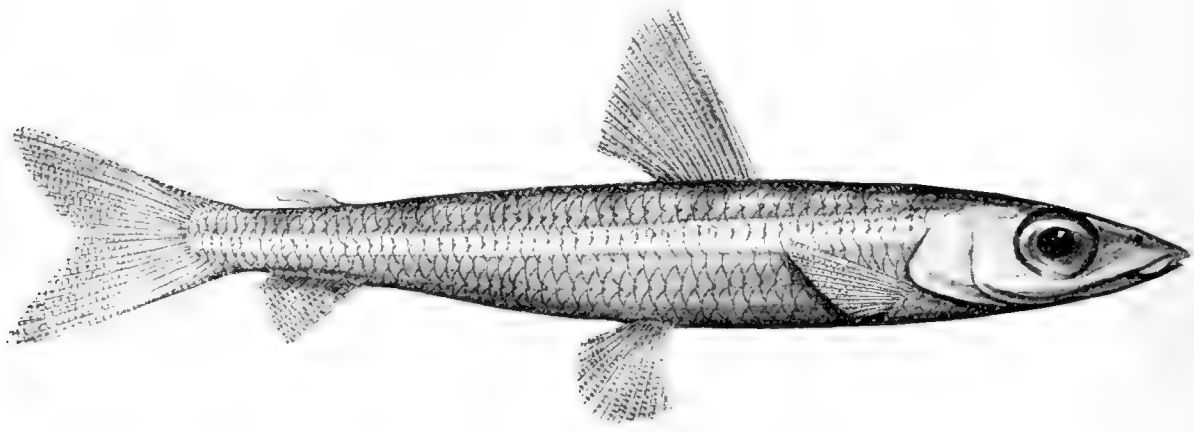


Fig. 61. *Argentina elongata.*

A deep-water fish, taken by the "Endeavour" in the Great Australian Bight.

FAMILY RETROPINNIDAE.

RETROPINNA Gill, 1862 (retropinna).

RETROPINNA SEMONI Weber (Smelt, Kantari).

Richardsonia retropinna Steind., Sitz. Akad. Wiss. Wien, liii, 1866, p. 469 (not Rich.).
Retropinna richardsonii Macl., P.L.S., N.S.W., vi, 1882, p. 228 (not Gill).
Retropinna retropinna Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 13 (not Rich.).
Prototroctes semoni Weber, Zool. Forschr. Aust., v, 1895, p. 274.
Jenynsella weatherilli Ogil., Ann. Qld. Mus., ix, 1908, p. 15.
Jenynsella semoni Ogil., Mem. Qld. Mus., i, 1912, p. 32.
Retropinna semoni Ogil., Mem. Qld. Mus., vi, 1918, p. 97; McCull., Rec. Aust. Mus., xiii, 1920, p. 49, pl. xi, fig. 2, 3.

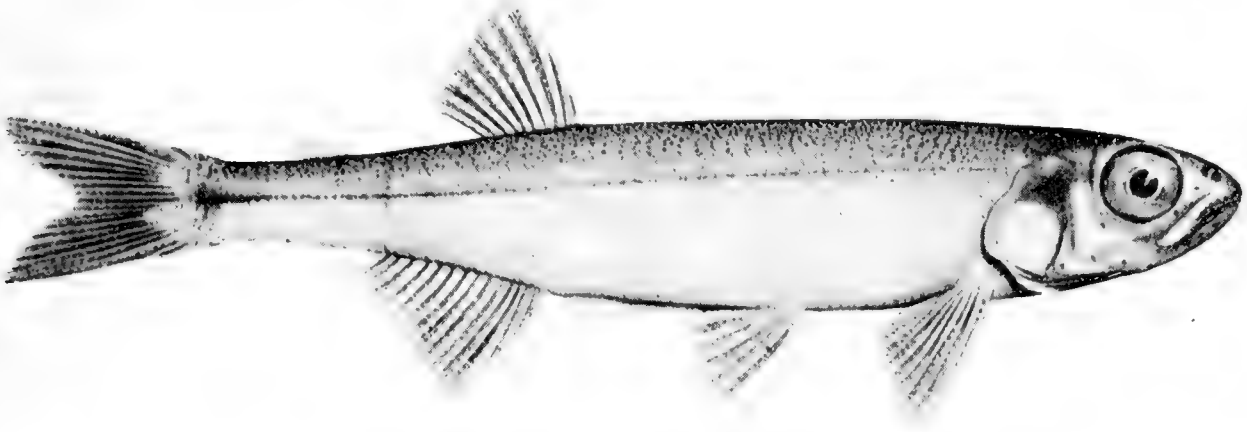


Fig. 62. *Retropinna semoni.*

Like its British prototype *(Osmerus)*, this little fish has an odour resembling that of a cucumber.

FAMILY STERNOPTYCHIDAE.

POLYIPNUS Günther, 1887 (spinosus).

POLYIPNUS TRIDENTIFER McCulloch (Luminous Fish).

Polyipnus tridentifer McCull., Endeavour Res., ii, 1914, p. 87, pl. xvi and fig. 4.

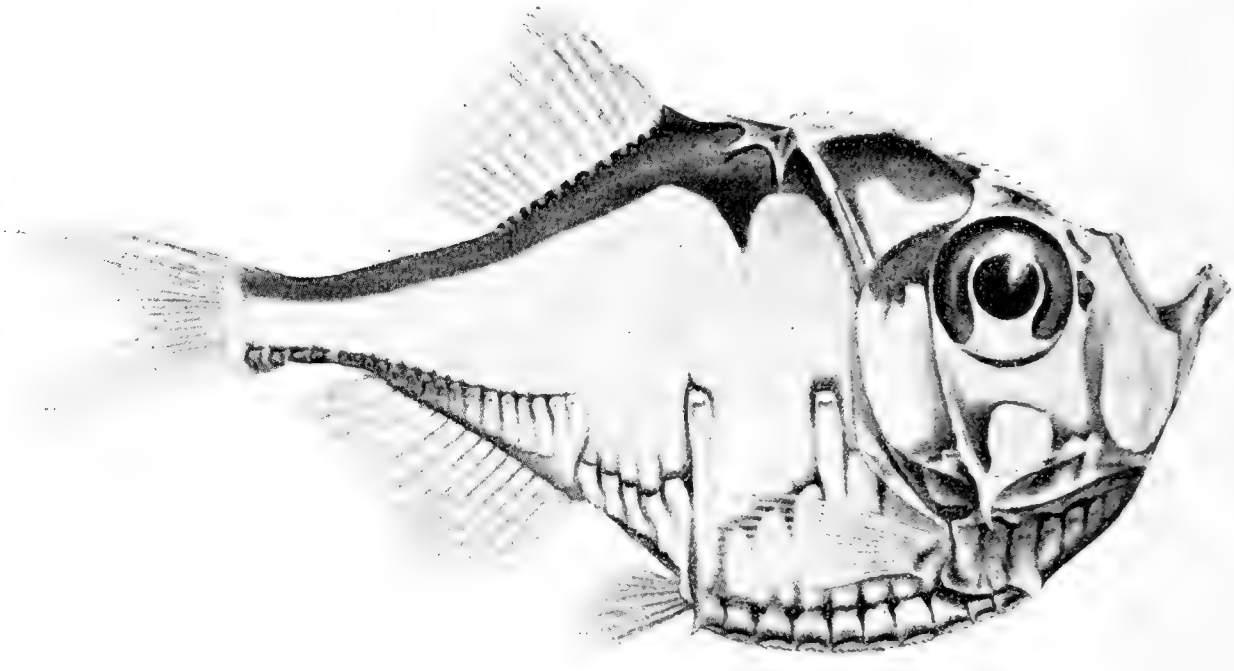


Fig. 63. *Polyipnus tridentifer.*

Fishes of this Family are recorded from considerable depths, but are believed to ascend to or near the surface at night. The markings on the lower half of the body are light-giving organs.

ORDER INIOMI.

FAMILY AULOPIDAE.

AULOPUS Cuvier, 1817 (filamentosus).

AULOPUS PURPURISSATUS Richardson (Sergeant Baker).

Aulopus purpurissatus Rich., Icon. Pisc., 1843, p. 6, pl. ii, fig. 3; McCoy, Prod. Zool. Viet., dec. vi, 1881, pl. liv, lv; Ogil., Edib. Fish. N.S.W., 1893, p. 166, pl. xl; Stead, Edib. Fish. N.S.W., 1908, p. 33, pl. ix; Roughley, Fish. Aust., 1916, p. 25, pl. iii.

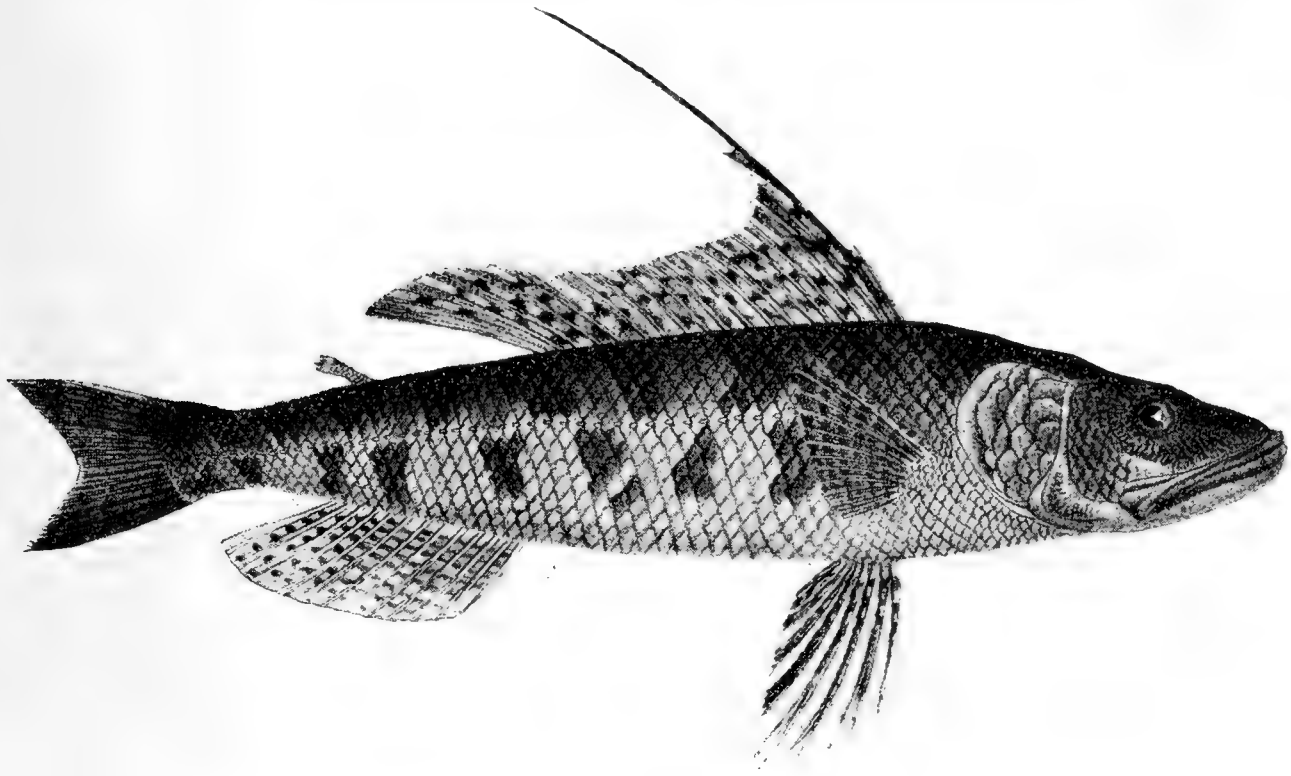


Fig. 64. *Aulopus purpurissatus.*

A good table fish, attaining a length of twenty-four inches. The long fin ray seen in the figure occurs in the male only.

FAMILY MYCTOPHIDAE.

MYCTOPHUM Rafinesque, 1810 (punctatum).

MYCTOPHUM CEPHALOTES Castelnau (Lantern Fish).

Neoscopelus cephalotes Cast., Res. Fish. Aust., 1875, p. 46.

The Lantern Fishes bear a large number of photophores or light organs, disposed chiefly on the head and towards the lower side of the body.

NEOSCOPELUS Johnson, 1863 (macrolepidotus).

NEOSCOPELUS MACROLEPIDOTUS Johnson (Lantern Fish).

Neoscopelus macrolepidotus Johnson, P.Z.S., 1863, p. 44, pl. vii; Goode & Bean, U.S. Nat. Mus. sp. Bull., ii (Oceanic Ichth.), 1895, p. 93, pl. xxix, fig. 108, 109; McCull., Endeavour Res., ii, 1914, p. 90, pl. xvii; Vaill., Exp. Sci. Trav. & Tal., 1888, p. 119, pl. ix, fig. 2.

Scopelus macrolepidotus Günth., Cat. Fish. Brit. Mus., v, 1864, p. 414.

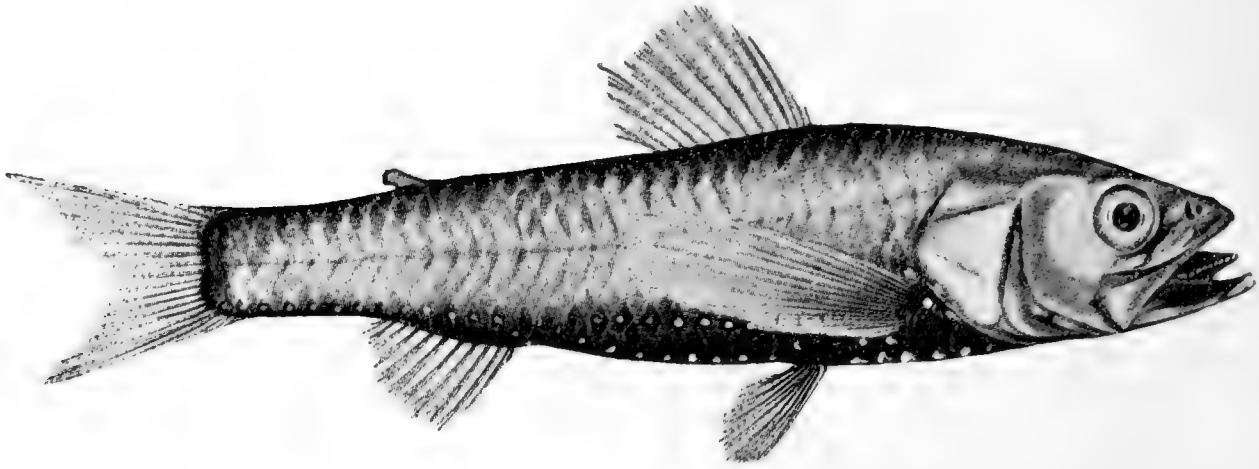


Fig. 66. *Neoscopelus macrolepidotus.*

ORDER NEMATOGNATHI.

FAMILY SILURIDAE.

CNIDOGLANIS Günther, 1864 (megastoma).

CNIDOGLANIS MEGASTOMA Richardson (Estuary Catfish).

Plotosus megastomus Rich., Zool. Ereb. & Terr., 1845, p. 31, pl. xxi, fig. 1-3.
Cnidoglanis megastoma Günth., Cat. Fish. Brit. Mus., v, 1864, p. 27; Ogil., Edib. Fish. N.S.W., 1893, p. 164; Stead, Edib. Fish. N.S.W., 1908, p. 29, pl. vii.
Chaeroplotosus decemfilis Kner, Reise Novara Fische, 1867, p. 300, pl. xii, fig. 1.
?Ostophycephalus duriceps Ogil., P.L.S., N.S.W., xxiv, 1899, p. 156.

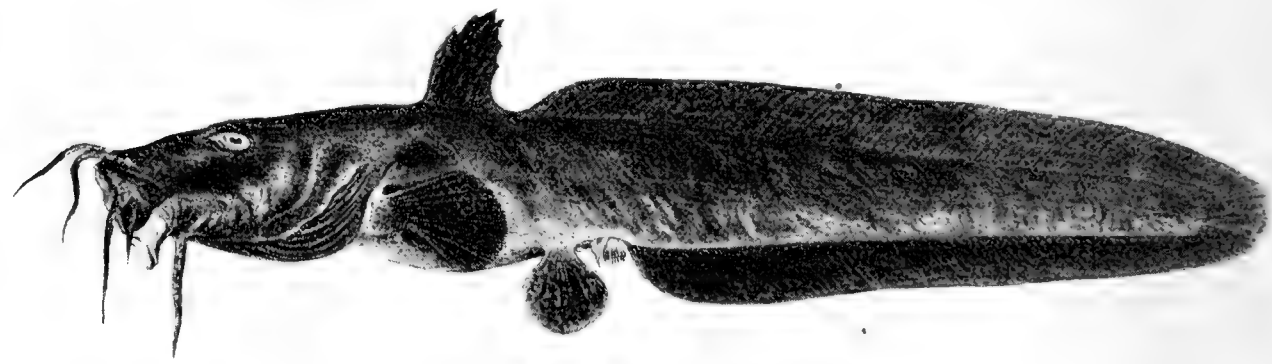


Fig. 67. *Cnidoglanis megastoma.*

A good-flavoured fish, but unsaleable owing to its prejudicial appearance, excepting at a nominal price to Asiatics. In our waters the fish is somewhat liable to a peculiar condition, in which the body is emaciated and the fins shrunken and hardened. Such a specimen appears to have been the foundation of Ogilby's *Ostophycephalus duriceps.*

TANDANUS Mitchell, 1838 (tandanus).

TANDANUS TANDANUS Mitchell (Fresh-water Catfish, Pamori).

Plotosus (Tandanus) tandanus Mitch., Exped. Aust. (ed. i), i, 1838, p. 95, pl. v, fig. 2.

Copidoglanis tandanus Günth., Cat. Fish. Brit. Mus., v, 1864, p. 26; Stead, Fish. Aust., 1906, p. 39, pl. i.

Tandanus tandanus Roughley, Fish. Aust., 1916, p. 19, pl. ii.

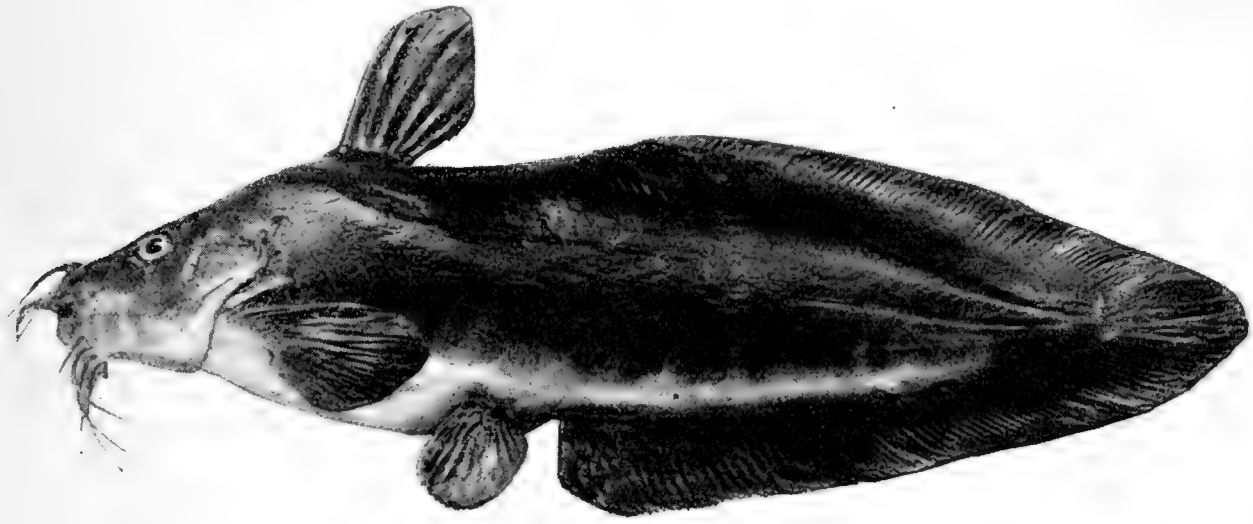


Fig. 68. *Tandanus tandanus.*

Said to be much better food than the Estuary Catfish, and frequently sold under some other name after removal of its tell-tale features. This fish makes a nest and guards its eggs.

NEOPLOTOSUS Castelnau, 1875 (waterhousii).

NEOPLOTOSUS WATERHOUSII Castelnau (S. Australian Catfish).

Neoplotosus waterhousii Cast., Res. Fish. Aust., 1875, p. 45.

NEOSILURUS Steindachner, 1867 (hyrtlii).

NEOSILURUS HYRTLII Steindachner (Central Australian Catfish).

Neosilurus hyrtlii Steind., Sitz. Akad. Wiss. Wien, lv, 1867, p. 14, pl. i, fig. 3.
Silurichthys australis Cast., Res. Fish. Aust., 1875, p. 45.
?Neosilurus australis Cast., P.L.S., N.S.W., ii, 1878, p. 239.
?Cainosilurus australis Macl., P.L.S., N.S.W., vi, 1881, p. 211.
Plotosus argenteus Zietz, Rep. Horn Exped., ii, 1896, p. 410, pl. xvi, fig. 7.
Neosilurus argenteus Zietz, T.R.S., S.A., xxxii, 1908, p. 296.

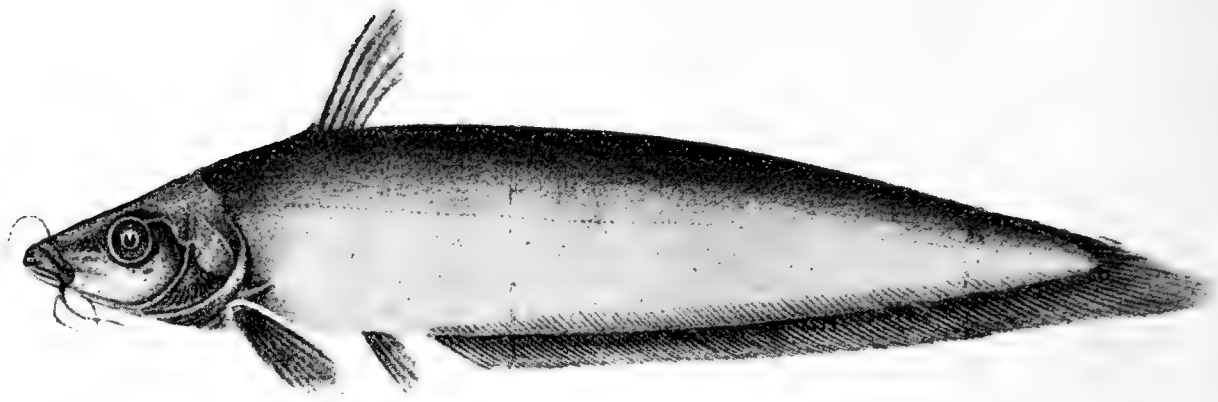


Fig. 70. *Neosilurus hyrtlii.*

In the last quoted paper, Zietz erroneously presumed that *N. hyrtlii* has but six barbels. Castelnau's count of a similar number in his *N. australis* may be due to imperfections in the single specimen examined, or to his characteristic carelessness.

ORDER SYMBRANCHII.

FAMILY SYMBRANCHIDAE.

CHEILOBRANCHUS Richardson, 1845 (dorsalis).

CHEILOBRANCHUS RUFUS Macleay (Shore Eel).

Chilobranchus rufus Macl., P.L.S., N.S.W., vi, 1881, p. 266; Waite, Rec. Aust. Mus., vi, 1906, p. 195, pl. xxxvi, fig. 1.

Symbranchus bengalensis Zietz, T.R.S., S.A., xxxii, 1908, p. 296 (not Bleek.).

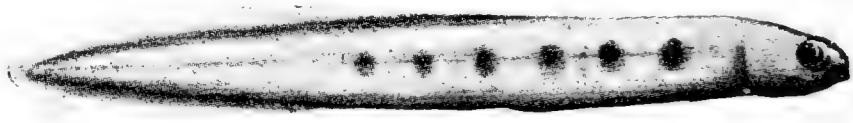


Fig. 71. *Cheilobranchus rufus.*

This little fish, the relationship of which is somewhat doubtful, is coloured green when alive; it changes to red in certain preservatives, hence the name *rufus.*

ORDER APODES.

FAMILY ANGUILLIDAE.

ANGUILLA Shaw, 1803 (anguilla).

ANGUILLA AUSTRALIS Richardson (Short-finned Eel).

Anguilla australis Rich., P.Z.S., 1841, p. 22 and Zool. Ereb. & Terr., 1848, p. 112, pl. xlv, fig. 1-6.

Fig. 72. *Anguilla australis.*

Eels are essentially marine fishes, and though this and the Long-finned Eel probably spend the greater part of their lives in fresh-water lakes or rivers, they descend to the sea for breeding purposes.

ANGUILLA REINHARDTII Steindachner (Long-finned Eel).

Anguilla reinhardtii Steind., Sitz. Akad. Wiss. Wien, lv, 1867, p. 15, text fig. (head); Ogil., Edib. Fish. N.S.W., 1893, p. 187 and P.L.S., N.S.W., xxii, 1898, p. 767; Stead, Edib. Fish. N.S.W., 1908, p. 31, pl. viii; Roughley, Fish. Aust., 1916, p. 22.

Fig. 73. *Anguilla reinhardtii.*

Not sufficiently appreciated as food, but its freedom from small bones is an estimable quality. "Have them spitch-cock'd—or stew'd—they're too oily when fried!"

FAMILY CONGRIDAE.

CONGER Houttuyn, 1764 (conger).

? CONGER WILSONI Bloch & Schneider (Conger Eel).

Gymnothorax wilsoni Bl. & Schn., Syst. Ichth., 1801, p. 529.
Conger wilsoni? Cast., P.Z.S., Viet., i, 1872, p. 193.

Fig. 74. *?Conger wilsoni.*

Scarcely distinguishable from the European Conger, which is an excellent food fish and the foundation of the famous turtle soup, to which the turtle furnishes only the garnish and the name.

FAMILY ECHELIDAE.

MURAENICHTHYS Bleeker, 1853 (gymnopterus).

MURAENICHTHYS BREVICEPS Günther (Slender Eel).

?Muraenichthys macropterus Klunz., Arch. f. Naturg., xxxviii, 1872, p. 43 (not Bleek.).

Muraenichthys breviceps Günth., A.M.N.H., (4), xvii, 1876, p. 401; McCull., Endeavour Res., i, 1911, p. 21, fig. 7.

ORDER SOLENICHTHYES.

FAMILY MACRORHAMPHOSIDAE.

CENTRISCOPS Gill, 1862 (humerosus).

CENTRISCOPS HUMEROSUS Richardson (Bellows Fish).

Centriscus humerosus Rich., Zool. Ereb. & Terr., 1846, p. 56, pl. xxxiv, fig. 5, 6.

Centriscops humerosus Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 234 (footnote); McCull., Endeavour Res., ii, 1914, p. 90.

Centriscus (Limiculina) humerosus Fowl., Proc. Acad. Nat. Sci. Phil., lix, 1907, p. 425.

Centriscops humerosus var. *obliquus* Waite, Rec. Cant. Mus., i, 1911, p. 170, pl. xxvi.

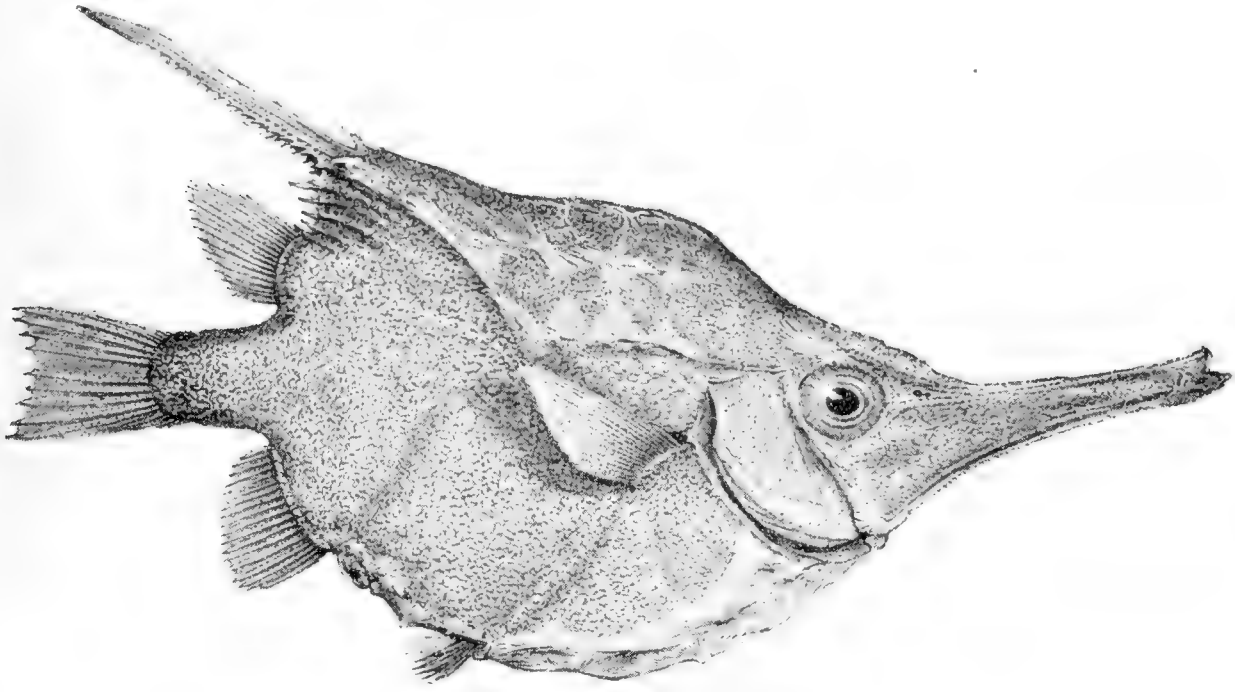


Fig. 76. *Centriscops humerosus.*

None of the members of this Order is of economic value.

FAMILY SYNGNATHIDAE.

SYNGNATHUS Linnaeus, 1758 (acus).

SYNGNATHUS POECILOLAEMUS Peters (Long-snouted Pipefish).

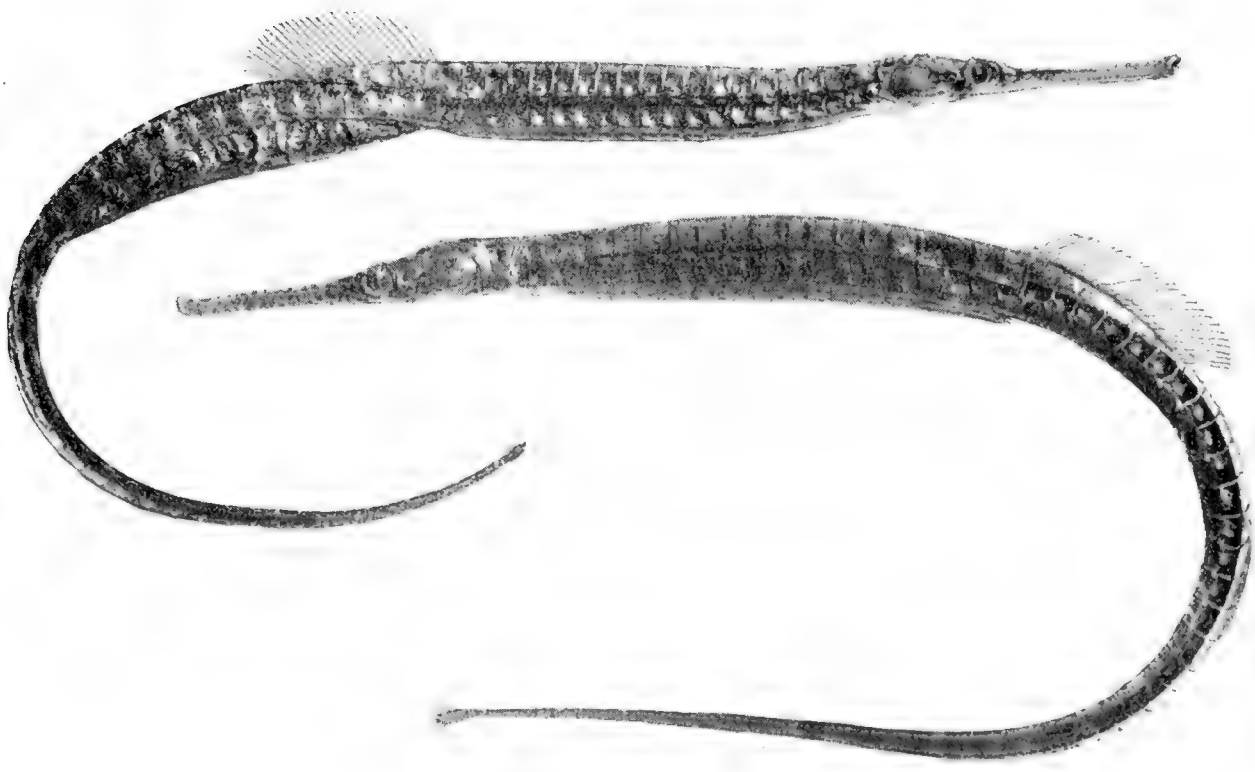


Fig. 77. *Syngnathus poecilolaemus*, male and female.

Syngnathus poecilolaemus Peters, Monatsb. Akad. Wiss. Berlin, 1869, p. 458; Dunck., Faun. Südwest Aust., ii, 1909, p. 245; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 295, fig. 39.
Syngnathus modestus Sauv., Bull. Soc. Phil. (7), iii, 1879, p. 209 (not Günth.),
Corythroichthys poecilolaemus McCull., Rec. W. Aust. Mus., i, 1912, p. 82, fig. 2.

SYNGNATHUS PHILLIPI Lucas (Medium-snouted Pipefish).

Syngnathus phillipi Lucas, P.R.S., Viet. (2), iii, 1891, p. 12; Dunck. Faun. Südwest Aust., ii, 1909, p. 245; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 297, fig. 40.
Corythroichthys phillipi McCull., Endeavour Res., i, 1911, p. 26, fig. 10.

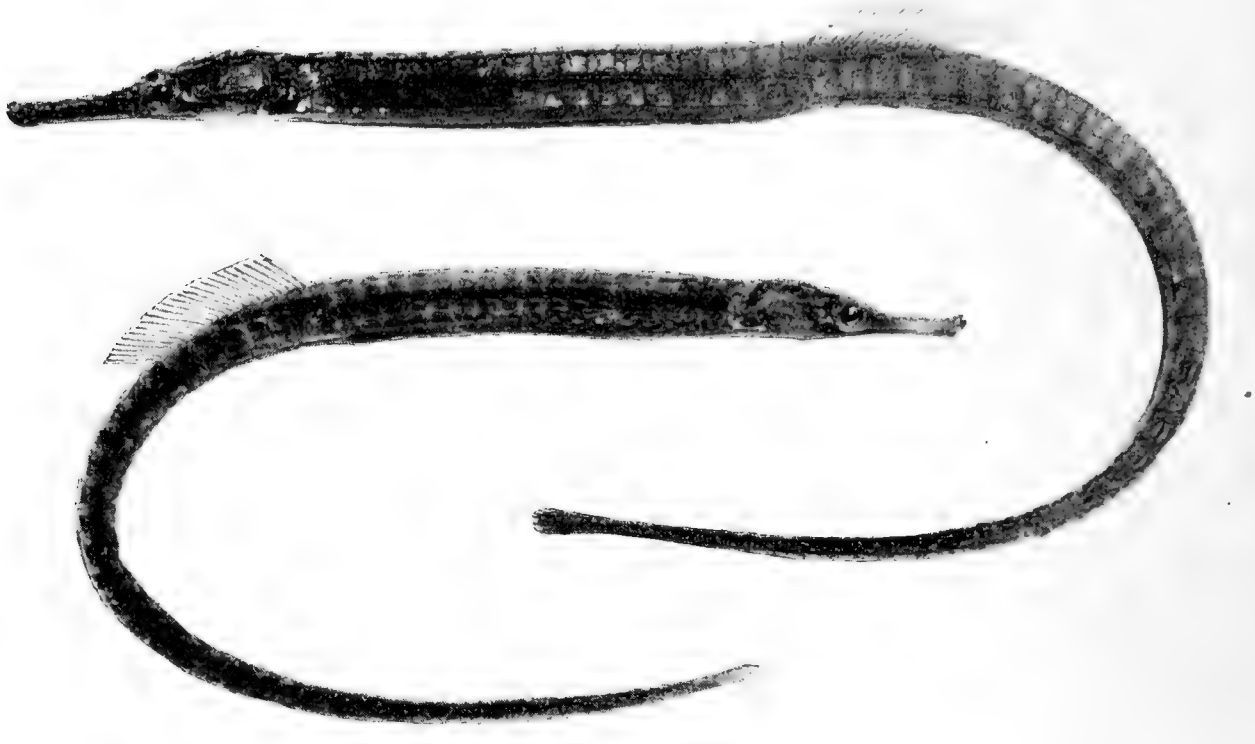


Fig. 78. *Syngnathus phillipi*, male and female.

SYNGNATHUS VERCOI Waite & Hale (Little Pipefish).

Ichthyocampus filum Zietz, T.R.S., S.A., xxxii, 1908, p. 298 (not Günth.).
Syngnathus vercoi Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 208, fig. 41.

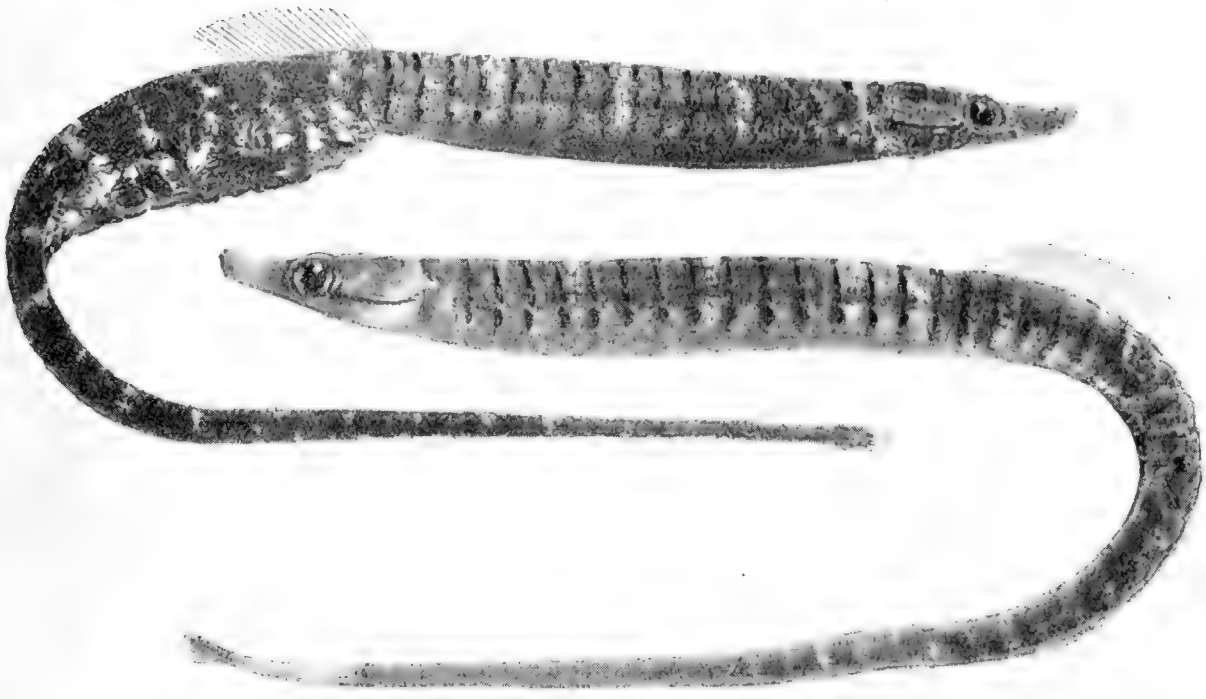


Fig. 79. *Syngnathus vercoi*, male and female.

SYNGNATHUS CURTIROSTRIS Castelnau (Short-snouted Pipefish).

Syngnathus curtirostris Cast., P.Z.S., Viet., i, 1872, p. 243 and ii, 1873, p. 79; Dunck., Faun. Südwest Aust., ii, 1909, p. 244; McCull & Waite, Rec. S. Aust. Mus., i, 1918, p. 39, pl. v, fig. 1; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 300, fig. 42.

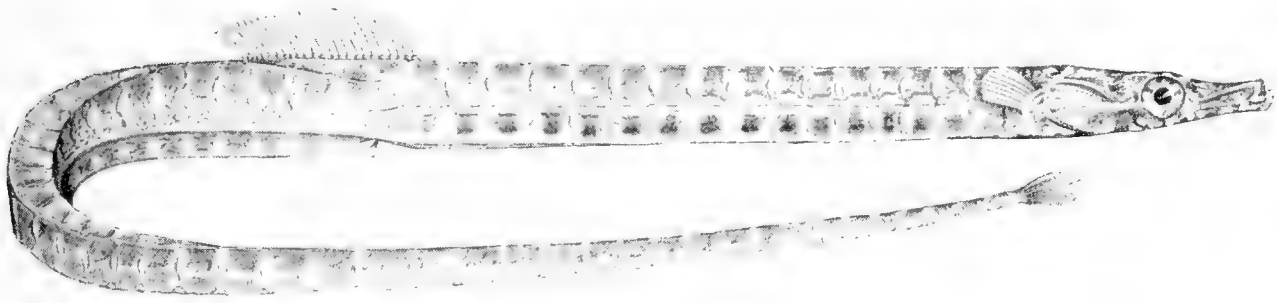


Fig. 80. *Syngnathus curtirostris.*

LEPTONOTUS Kaup, 1853 (blainvillianus).

LEPTONOTUS COSTATUS Waite & Hale (Deep-bodied Pipefish).

Leptonotus costatus Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 301, fig. 43.

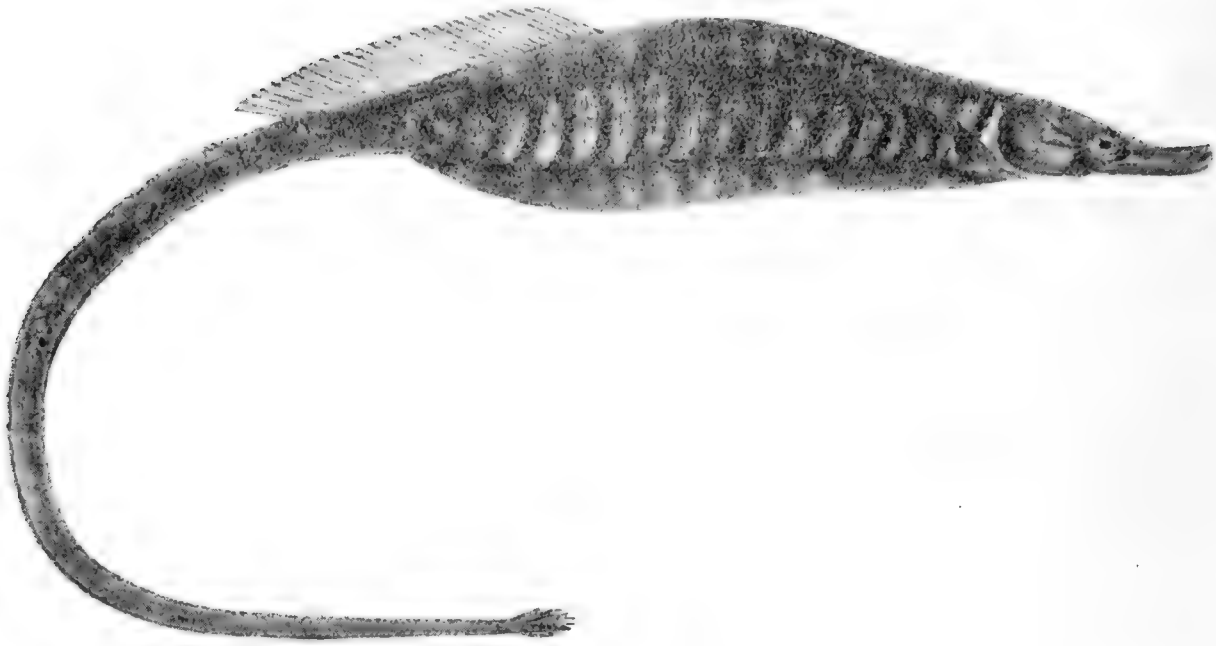


Fig. 81. *Leptonotus costatus.*

HISTIOGAMPHELUS McCulloch, 1914 (briggsii).

HISTIOGAMPHELUS ROSTRATUS Waite & Hale (Knife-snouted Pipefish).

Syngnathus semifasciatus Zietz, T.R.S., S.A., xxxii, 1908, p. 298 (not Günth.).
Doryichthys heterosoma Zietz, *op. cit.*, p. 299 (not Bleek.).
Histiogamphelus rostratus Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 303, fig. 44.

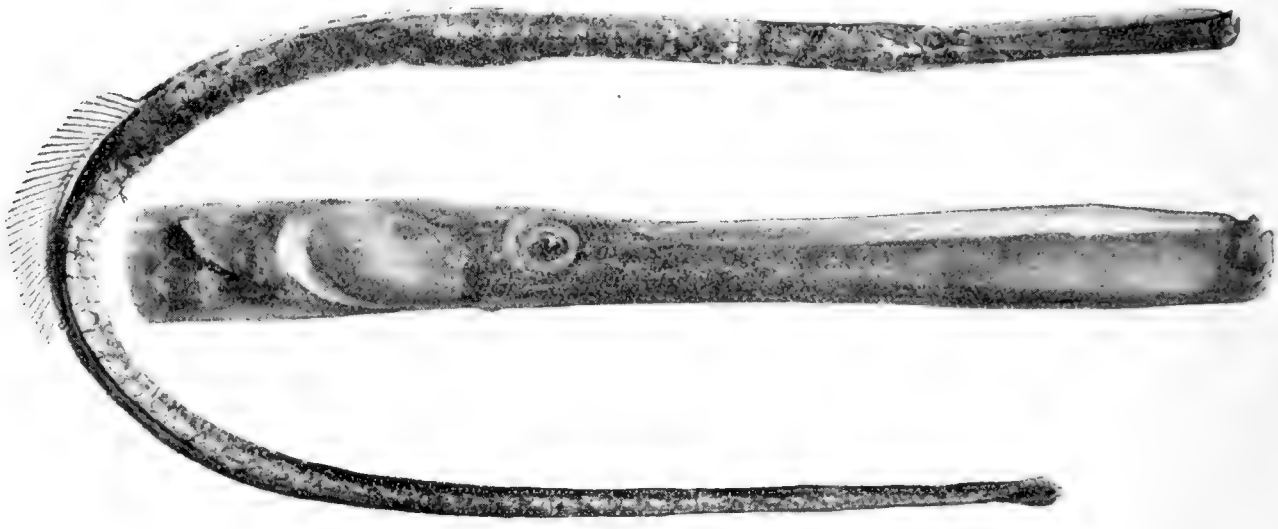


Fig. 82. *Histiogamphelus rostratus.*

ICHTHYOCAMPUS Kaup, 1853 (belcheri).

ICHTHYOCAMPUS CRISTATUS McCulloch & Waite (Crested Pipefish).

Ichthyocampus cristatus McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 40, fig. 26; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 304, fig. 45.

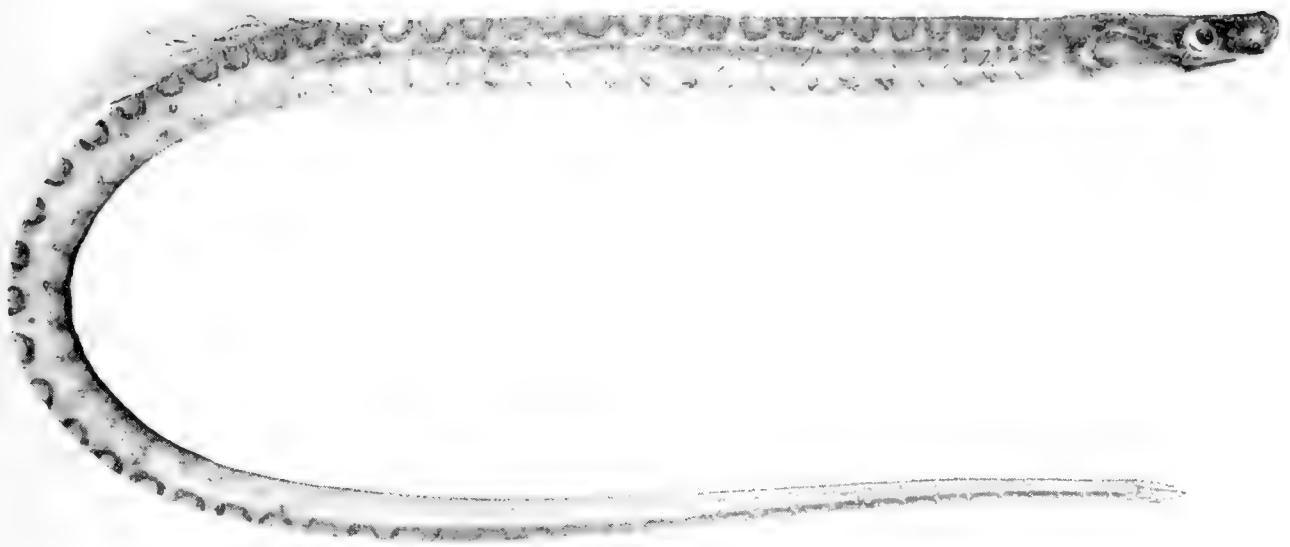


Fig. 83. *Ichthyocampus cristatus.*

LISSOCAMPUS Waite & Hale, 1921 (caudalis).

LISSOCAMPUS CAUDALIS Waite & Hale (Smooth Pipefish).

Lissocampus caudalis Waite & Hale, Rec. S. Aust., Mus., i, 1921, p. 306, fig. 46.

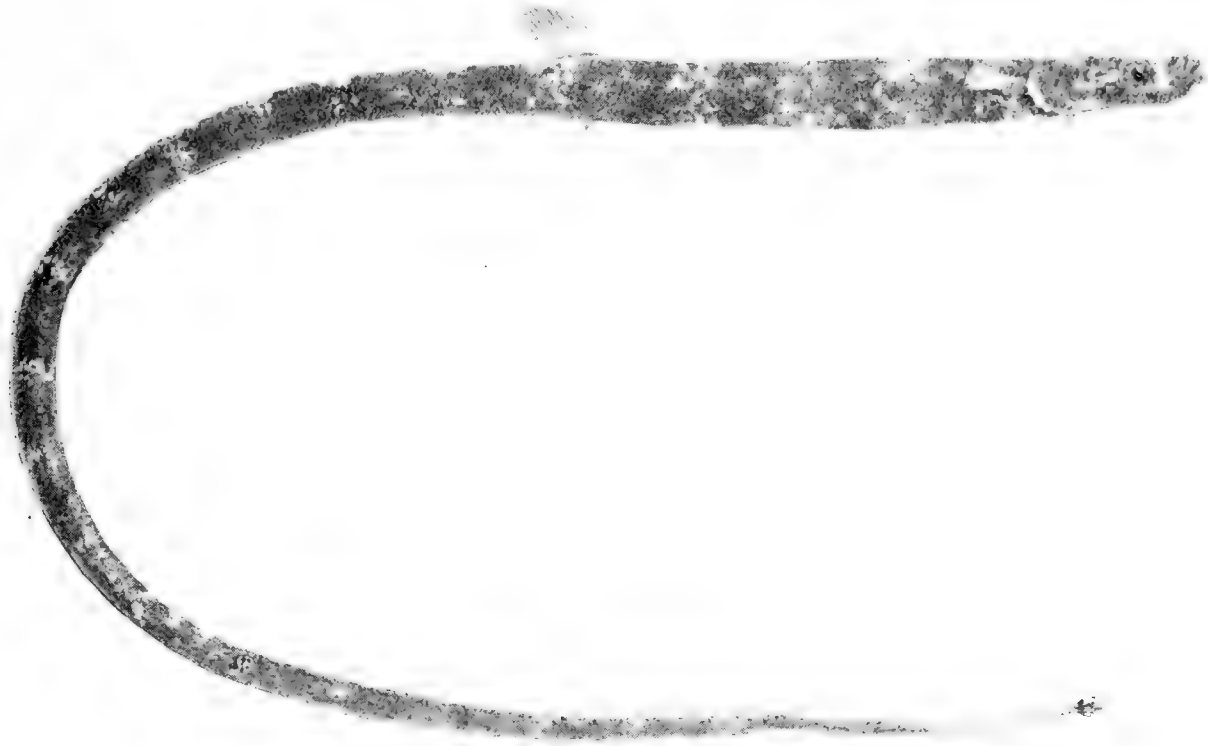


Fig. 84. *Lissocampus caudalis.*

LEPTOICHTHYS Kaup, 1853 (fistularius).

LEPTOICHTHYS FISTULARIUS Kaup (Brush-tailed Pipefish).

Leptoichthys fistularius Kaup, Arch. f. Naturg., xix, 1853, p. 232 and Cat. Lophob., 1856, p. 52; Dunck., Faun. Südwest Aust., ii, 1909, p. 234; Waite & Hale, Rec. S. Aust. Mus., i. 1921, p. 307, fig. 47.

Leptoichthys castelnaui Macl., P.L.S., N.S.W., vi, 1881, p. 295.

Fig. 85. *Leptoichthys fistularius.*

STIGMATOPORA Kaup, 1853 (argus).

STIGMATOPORA ARGUS Richardson (Spotted Pipefish).

Syngnathus argus Rich., P.Z.S., 1840, p. 29 and T.Z.S., iii, 1849, p. 183, pl. vii, fig. 2.

Stigmatophora argus Kaup, Arch. f. Naturg. xix, 1853, p. 233 and Cat. Lophob., 1856, p. 53; Dunck., Fauna Südwest Aust., ii, 1909, p. 239; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 308, fig. 48.

Stigmatophora olivacea Cast., P.Z.S., Vict., i, 1872, p. 244 and ii, 1873, p. 77; Ogil., Mem. Qld. Mus., i, 1912, p. 36.

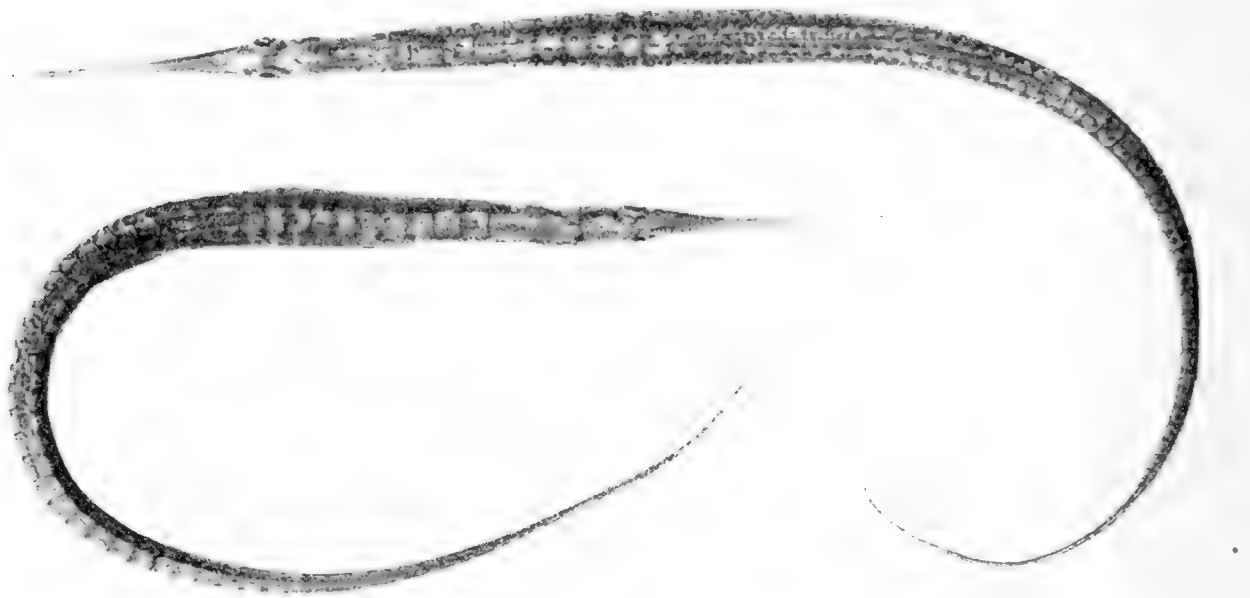


Fig. 86. *Stigmatopora argus*, female and male.

Gastrotokeus gracilis Klunz., Arch. f. Naturg., xxxviii, 1872, p. 44.

Stigmatophora unicolor Cast., Res. Fish. Aust., 1875, p. 49.

Stigmatophora depressiuscula and *S. gracilis* Macl., P.L.S., N.S.W., vi, 1882, p. 299.

Stigmatophora argus var. *brevicaudata* Lucas, P.R.S., Vict., iii (n.s.), 1891, p. 14.

STIGMATOPORA NIGRA Kaup (Wide-bodied Pipefish).

Stigmatopora nigra Kaup, Arch. f. Naturg., xix, 1853, p. 233 and Cat. Lophob., 1856, p. 53; Dunck., Fauna Südwest Aust., ii, 1909, p. 239; McCull., Aust. Zool., i, 1914, p. 29, fig. 1, 2, 3 (portions); Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 311, fig. 49.

Stigmatophora boops Cast., P.Z.S., Vict., i, 1872, p. 203.

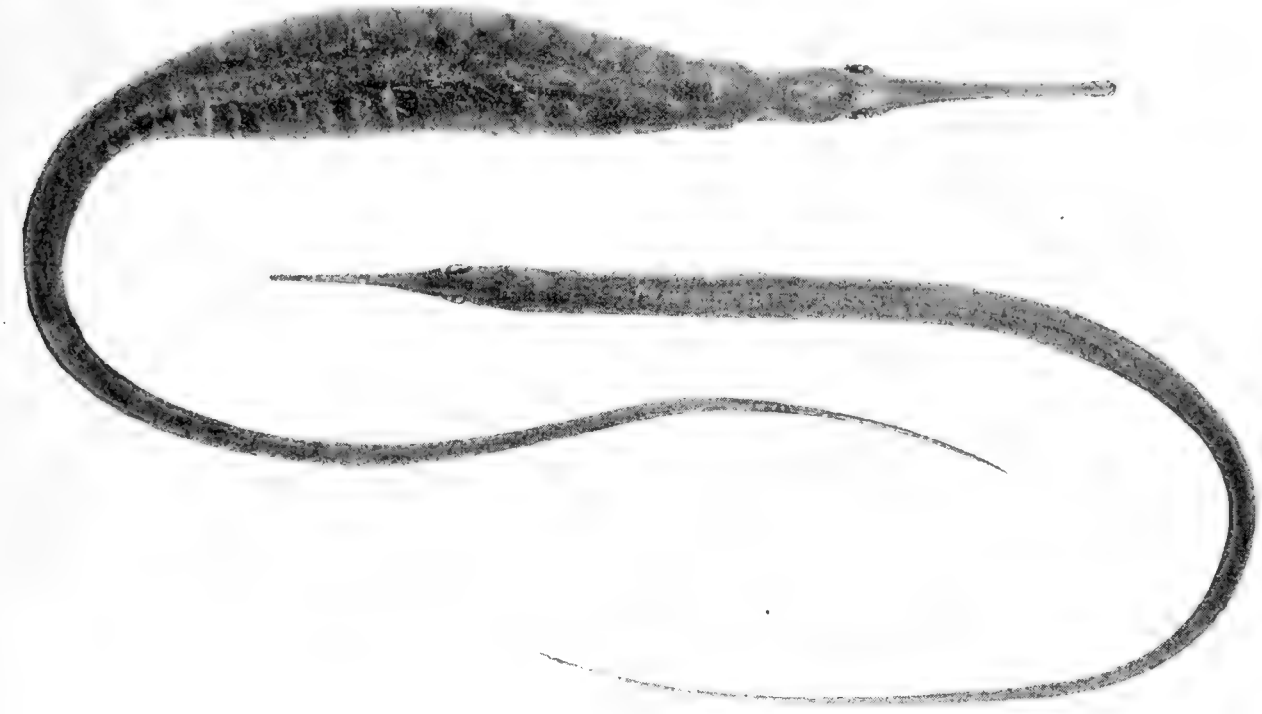


Fig. 87. *Stigmatopora nigra*, female and male.

SOLEGNATHUS Swainson, 1839 (hardwickii).

SOLEGNATHUS ROBUSTUS McCulloch (Pipe-horse).

Solenognathus spinosissimus Zietz, T.R.S., S.A., xxxii, 1908, p. 299 (not Günth.).

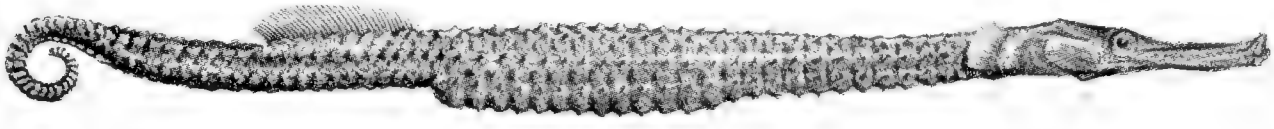


Fig. 88. *Solegnathus robustus.*

Solegnathus robustus McCull., Endeavour Res., i, 1911, p. 28, pl. ix, fig. 2; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 312, fig. 50.

PHYLLOPTERYX Swainson, 1839 (foliatus).

PHYLLOPTERYX FOLIATUS Shaw (Common Sea Dragon).

Syngnathus foliatus Shaw, Gen. Zool., v, 1804, p. 456, pl. clxxx.

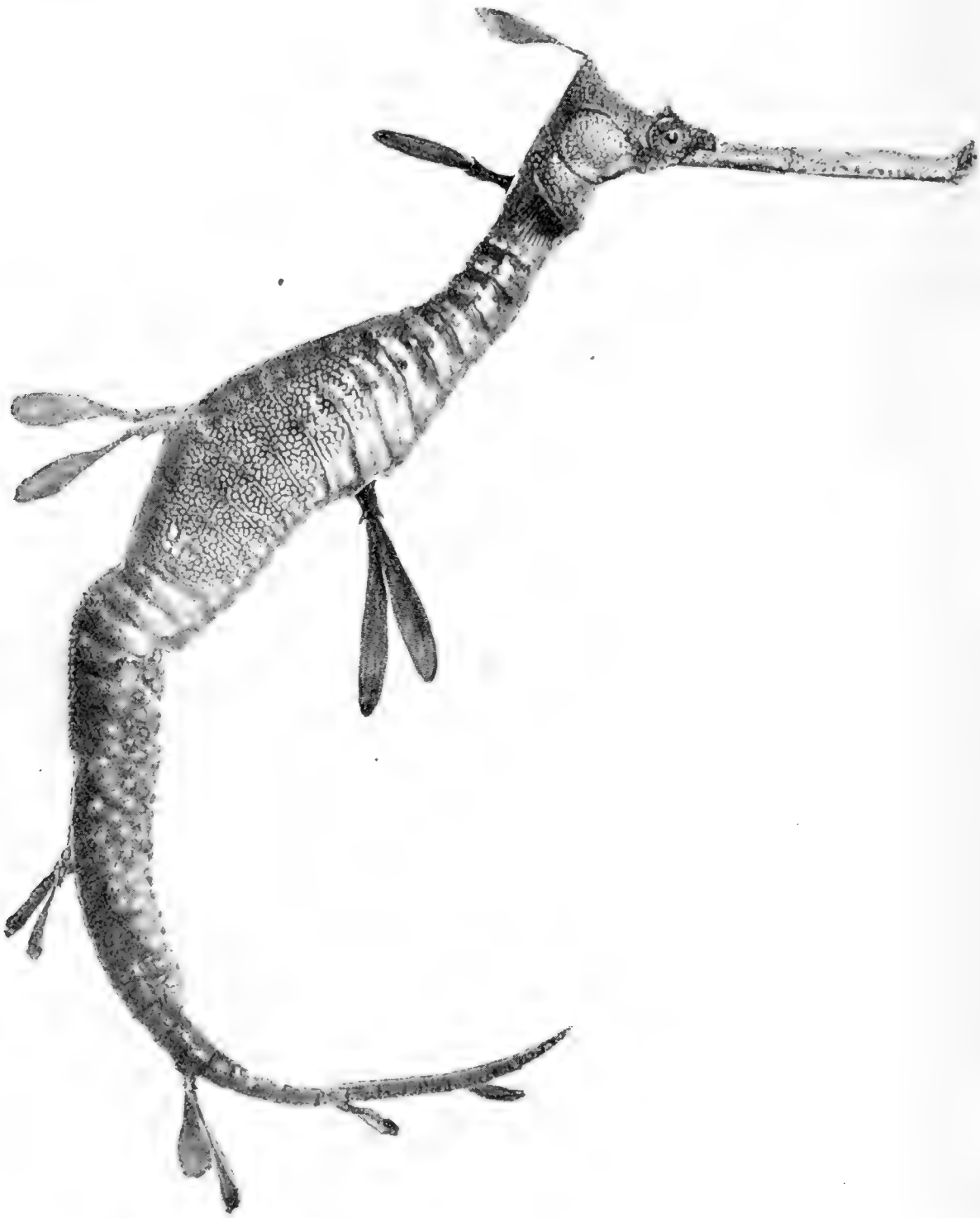


Fig. 89. *Phyllopteryx foliatus*, male with eggs.

Syngnathus taeniopterus Lacep., Ann. Mus., iv, 1804, p. (184-211), pl. lviii, fig. 3.
Phyllopteryx foliatus Swains., Nat. Hist. Fish., ii, 1839, p. 332, fig. 109; Günth., P.Z.S., 1865, p. 327, pl. xiv; McCoy, Prod. Zool. Vict., dec. vii, 1882, pl. lxv, fig. 1; Dunck., Faun. Südwest Aust., ii, 1909, p. 236; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 313, fig. 51.
Phillopteryx elongatus Cast., P.Z.S., Vict., i, 1872, p. 243 and ii, 1873, p. 70.
Phyllopteryx altus McCoy, Prod. Zool. Vict., dec. vii, 1882, p. 20.

Males of the Pipe-fishes, Sea-horses, and other forms comprising the Order Lophobranchii, carry the eggs glued to the underside of the body or tail, or in a more or less perfect pouch developed thereon. The accompanying photograph of a male Sea-dragon shows a complement of eggs attached to the underside of the tail.

PHYLLOPTERYX EQUES Günther (Leafy Sea Dragon).

Fig. 90. *Phyllopteryx eques.*

Phyllopteryx eques Günth., P.Z.S., 1865, p. 327, pl. xv; Dunck., Faun. Südwest Aust., ii, 1909, p. 237; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 315, fig. 52.
Phycodurus eques Gill, Proc. U.S Nat. Mus., xviii, 1895, p. 159.

ACENTRONURA Kaup, 1853 (gracilissima).

ACENTRONURA AUSTRALE Waite & Hale (Little Pipe-horse).

Acentronura australe Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 317, fig. 53.

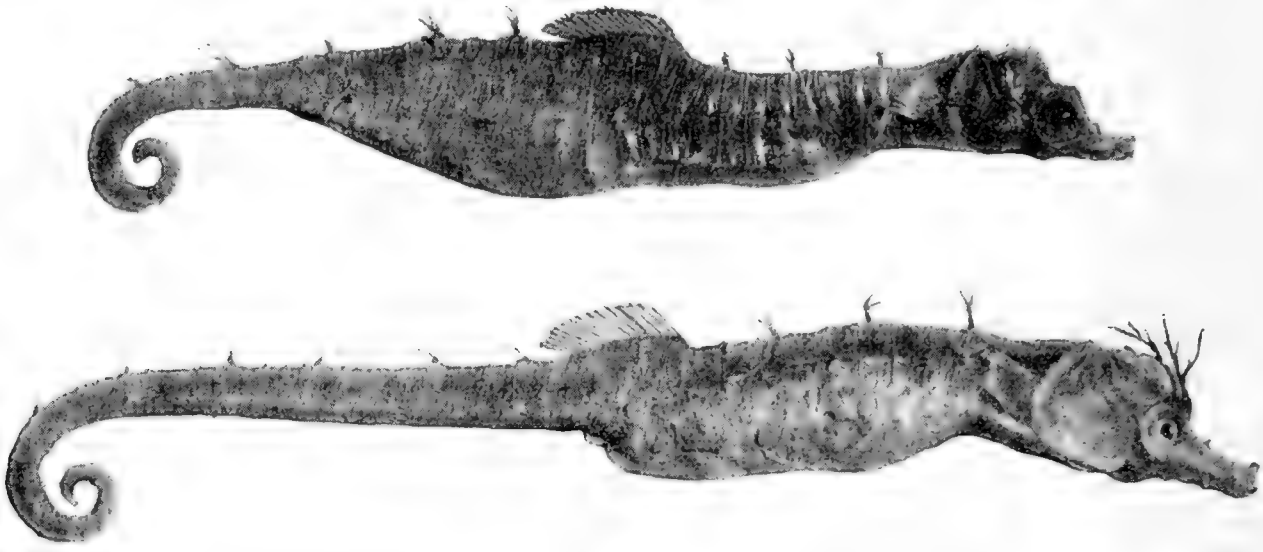


Fig. 91. *Acentronura australe*, male and female.

HIPPOCAMPUS Rafinesque, 1810 (hippocampus).

HIPPOCAMPUS ABDOMINALIS Lesson (Sea-horse).

Hippocampus abdominalis Less., in Ferussac, Bull. Sci. Nat., xi, 1827, p. 127; Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 48, pl. fig. 4; Kaup, Cat. Lophob, 1856, p. 17, pl. iii, fig. 3; Dunck., Faun. Südwest Aust., ii, 1909, p. 247; Waite, Rec. Cant. Mus., i, 1911, p. 175, pl. xxviii; McCull., Endeavour Res., i, 1911, p. 29, pl. vi, fig. 1; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 319, fig. 54.
Hippocampus gracilformis McCull., Endeavour Res., i, 1911, p. 29, pl. vi, fig. 2.

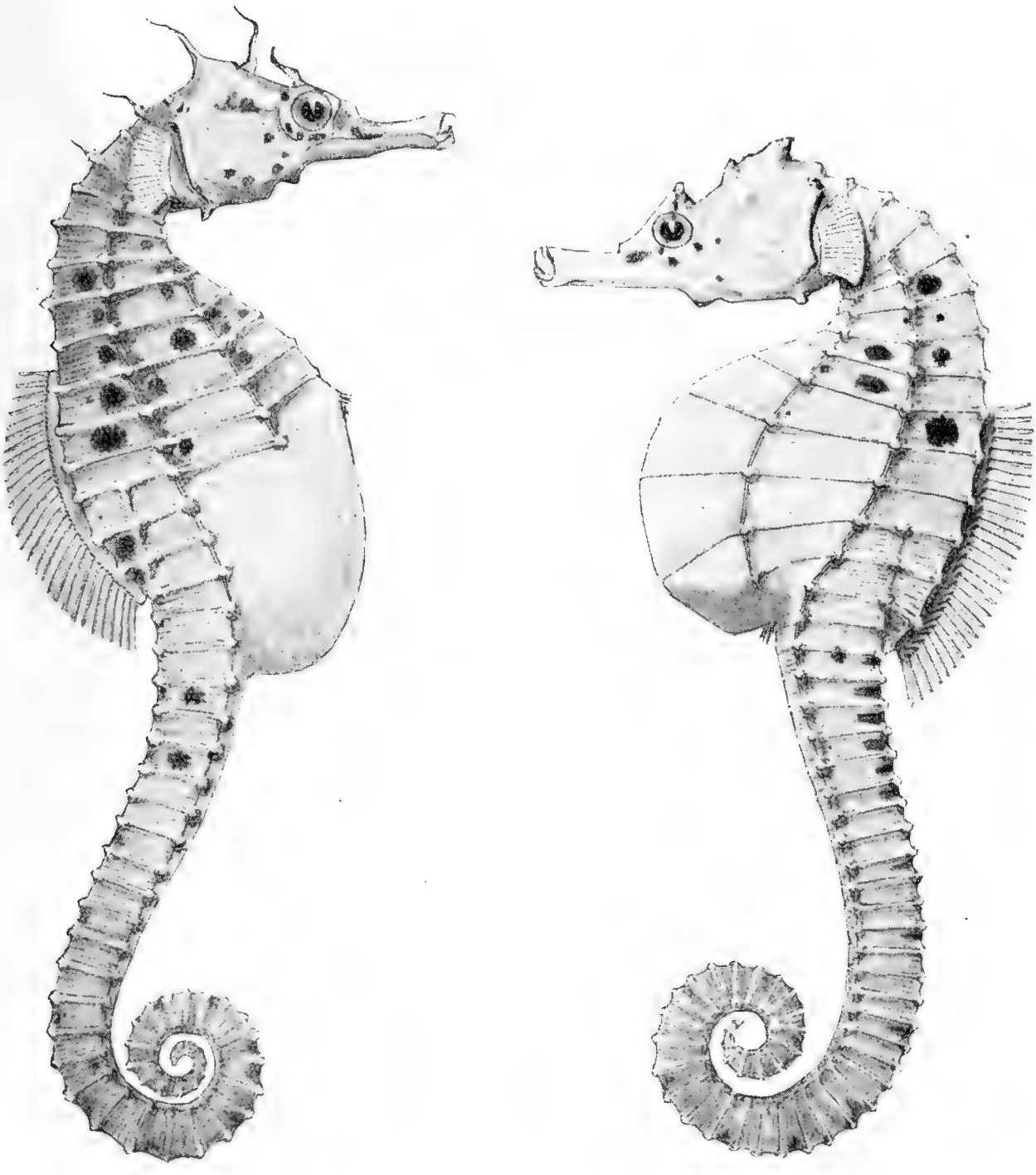


Fig. 92. *Hippocampus abdominalis*, male and female.

HIPPOCAMPUS NOVAE-HOLLANDIAE Steindachner (Common Sea-horse).

Syngnathus hippocampus Shaw, in White's Voy. N.S.W., 1790, p. 295, pl. 1, fig. 2 (not Linn.).

Hippocampus novae-hollandiae Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 474, pl. i, fig. 2; Dunck., Faun. Südwest Aust., ii, 1909, p. 248; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 320, fig. 55.

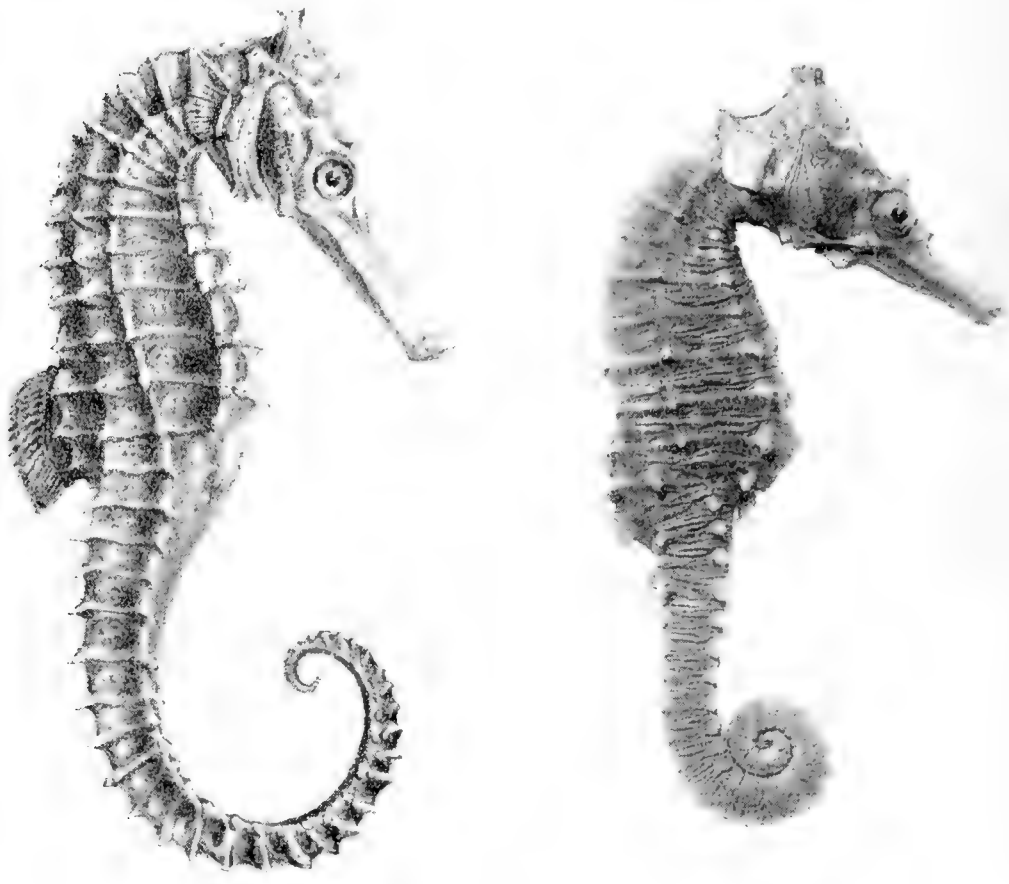


Fig. 93. *Hippocampus novae-hollandiae*, male and female.

HIPPOCAMPUS BREVICEPS Peters (Short-headed Sea-horse).

Hippocampus brevicceps Peters, Mon. Akad. Wiss. Berlin, 1869, p. 710; McCoy, Prod. Zool. Vict., dec. vii, 1882, pl. lxv, fig. 2; Dunck., Faun. Südwest Aust., ii, 1909, p. 247; Waite & Hale, Rec. S. Aust. Mus., i, 1921, p. 321, fig. 56.

Hippocampus tuberculatus Cast., Res. Fish, Aust., 1875, p. 48.

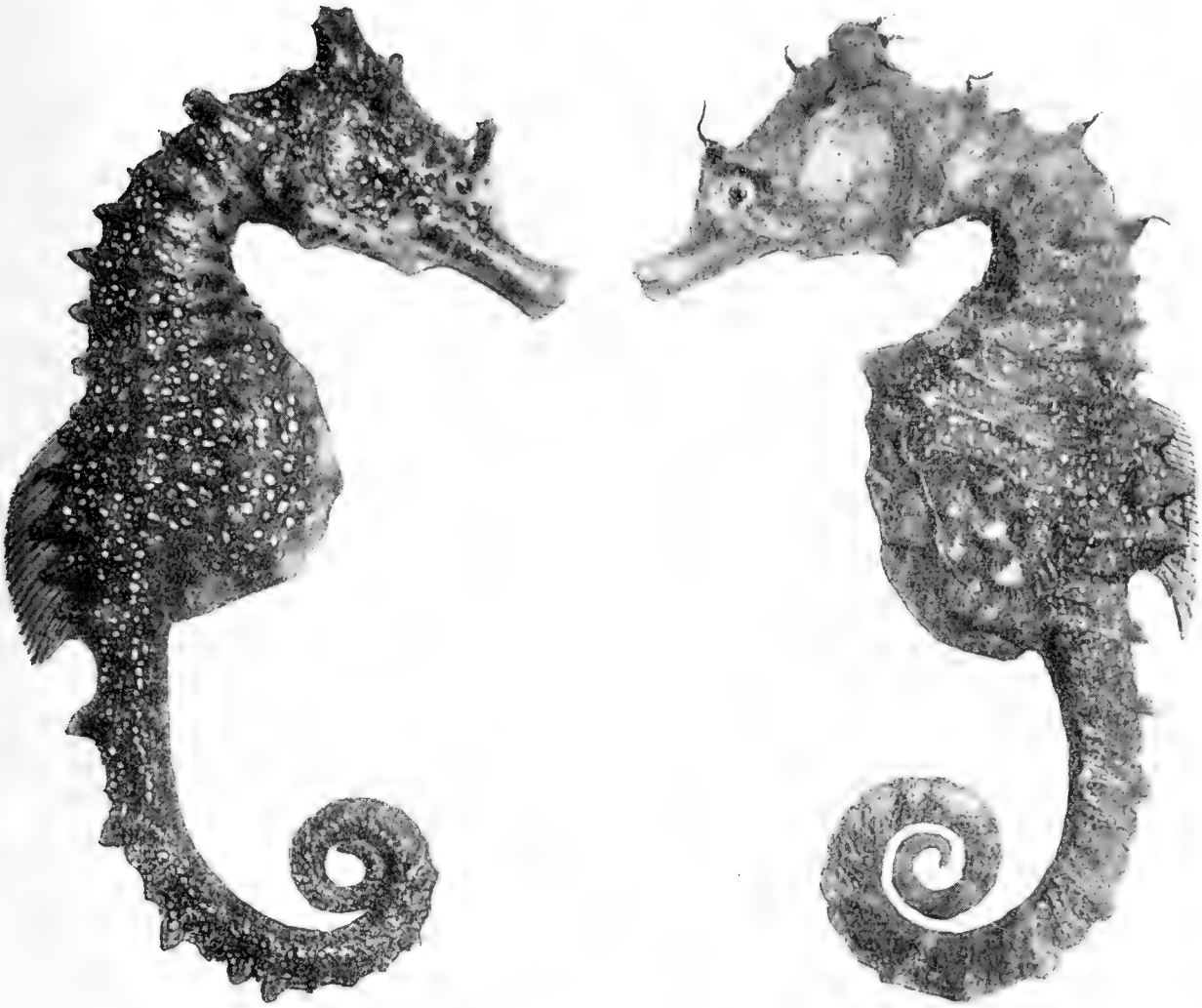


Fig. 94. *Hippocampus breviceps*, male and female.

ORDER HYPOSTOMIDES.

FAMILY PEGASIDAE.

ACANTHOPEGASUS McCulloch, 1915 (lancifer).

ACANTHOPEGASUS LANCIFER Kaup.

Pegasus natans Kaup, Cat. Lophob., 1856, p. 4, pl. i, fig. 2 (not Linn.).
Pegasus lancifer Kaup, Arch. f. Naturg., xxii, 1861, p. 116, 117.
Parapegasus lancifer Dum., Hist. Nat. Poiss., ii, 1870, p. 294.
Acanthopegasus lancifer McCull., Endeavour Res., iii, 1915, p. 106, fig. 1.

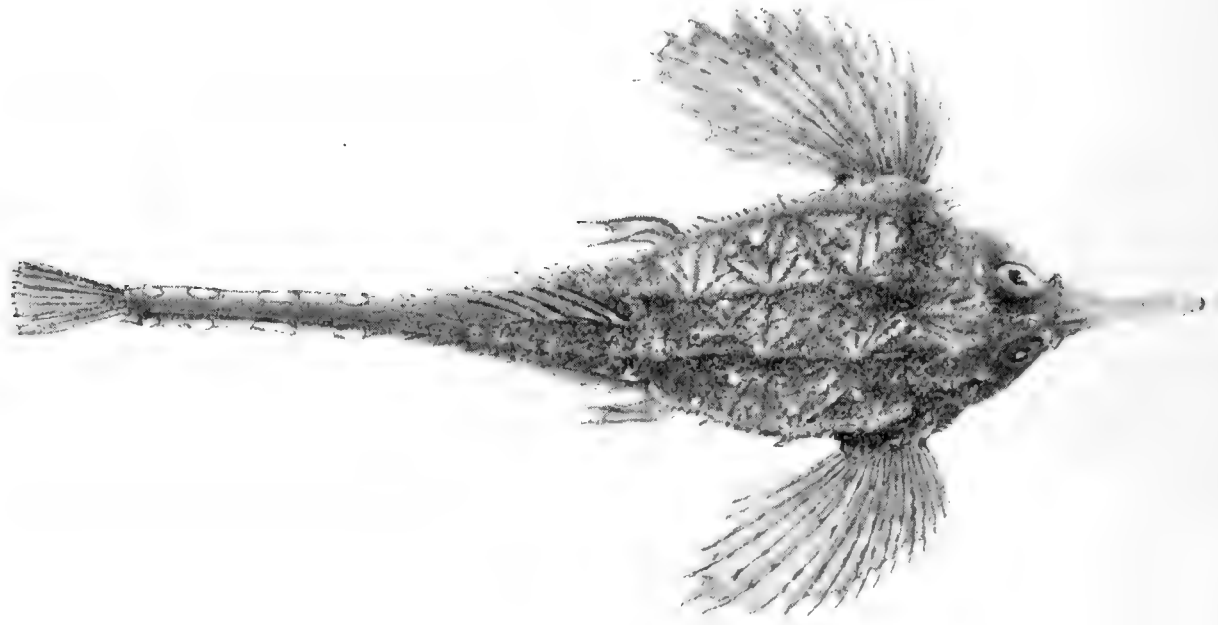


Fig. 95. *Acanthopegasus lancifer.*

ORDER SYNENTOGNATHI.

FAMILY SCOMBRESOCIDAE.

SCOMBRESOX Lacepède, 1803 (camperii).

SCOMBRESOX FORSTERI Cuvier & Valenciennes (Billfish, Skipper).

Scombresox forsteri Cuv. & Val., Hist. Nat. Poiss., xviii, 1846, p. 481.

Scomberesox saurus var. *forsteri* McCoy, Prod. Zool. Vict., dec. xiv, 1887, pl. cxxxv, fig. 2.

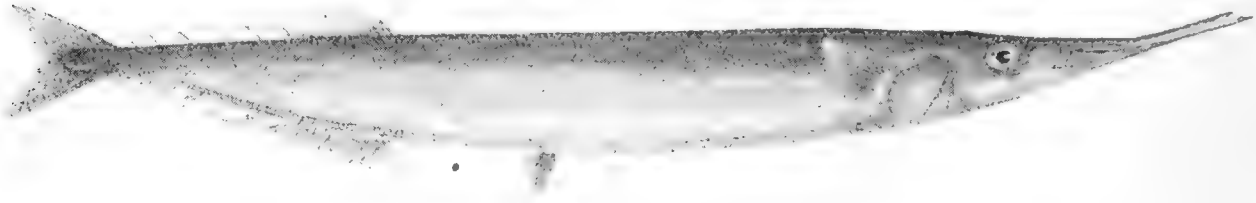


Fig. 96. *Scombresox forsteri.*

Frequently netted with Garfishes, to which it is allied.

FAMILY EXOCOETIDAE.

CYPSELURUS Swainson, 1839 (nuttalii).

CYPSELURUS CRIBROSUS Kner (Flying Fish).

Exocoetus unicolor? Cuv. & Val., vel *cribrosa* Kner, Reise Novara, i, 1867, p. 325 (not Cuv. & Val.).

Exonautes fulvipes and *E. cribrosus* Ogil., P.R.S., Qld., xxi, 1908, p. 8, 13.

Cypselurus cribrosus McCull., Mem. Qld. Mus., v, 1916, p. 59, pl. vii.

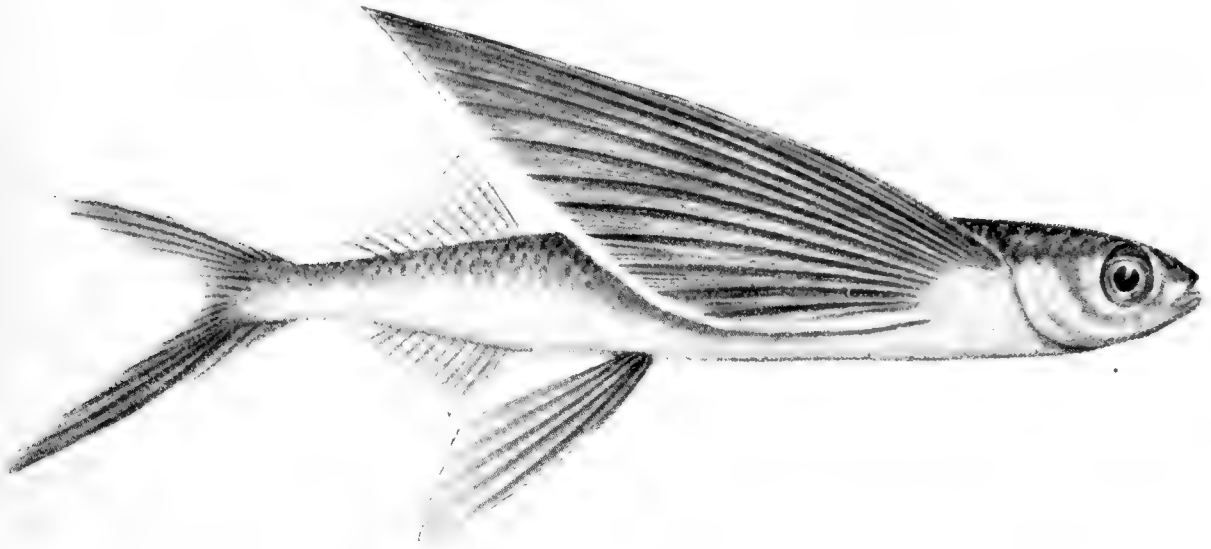


Fig. 97. *Cypselurus cribrosus.*

FAMILY HEMIRHAMPHIDAE.

HYPORHAMPHUS Gill, 1859 (tricuspidatus).

HYPORHAMPHUS INTERMEDIUS Cantor (Garfish).

Hemirhamphus intermedius Cant., A.M.N.H., ix, 1842, p. 485; McCoy, Prod. Zool. Vict., dec. xiv, 1887, pl. cxxxv, fig. 1; Ogil., Edib. Fish. N.S.W., 1893, p. 172, pl. xlii; Roughley, Fish. Aust., 1916, p. 27, pl. iv.

Hemirhamphus melanochir Cuv. & Val., Hist. Nat. Poiss., xix, 1846, p. 41.

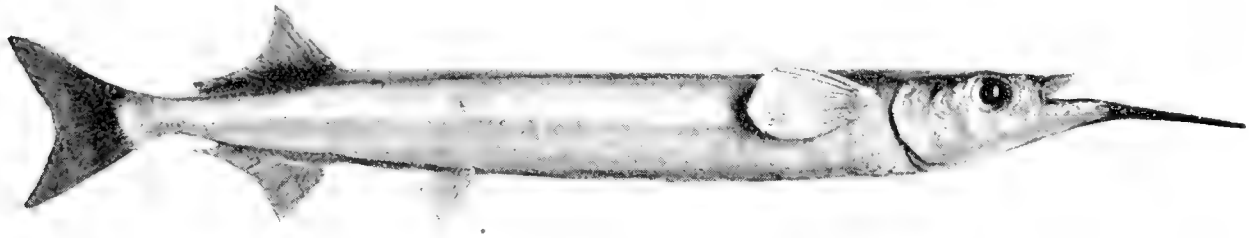


Fig. 98. *Hyporhamphus intermedius.*

A recognized breakfast fish and would be more appreciated but for the presence of small hair-like bones.

ORDER ANACANTHINI.

FAMILY MACROURIDAE.

NEMATONURUS Günther, 1887 (armatus).

NEMATONURUS ARMATUS Hector.

Macrurus armatus Hect., A.M.N.H. (4), xv, 1875, p. 81 and T.N.Z. Inst., vii, 1875, p. 249, pl. xi, fig. 78a.

Coryphaenoides variabilis Günth., A.M.N.H. (5), ii, 1878, p. 27.
Nematonurus armatus Günth., Chall. Rep., xxii, 1887, p. 150, pl. xl, fig. A.

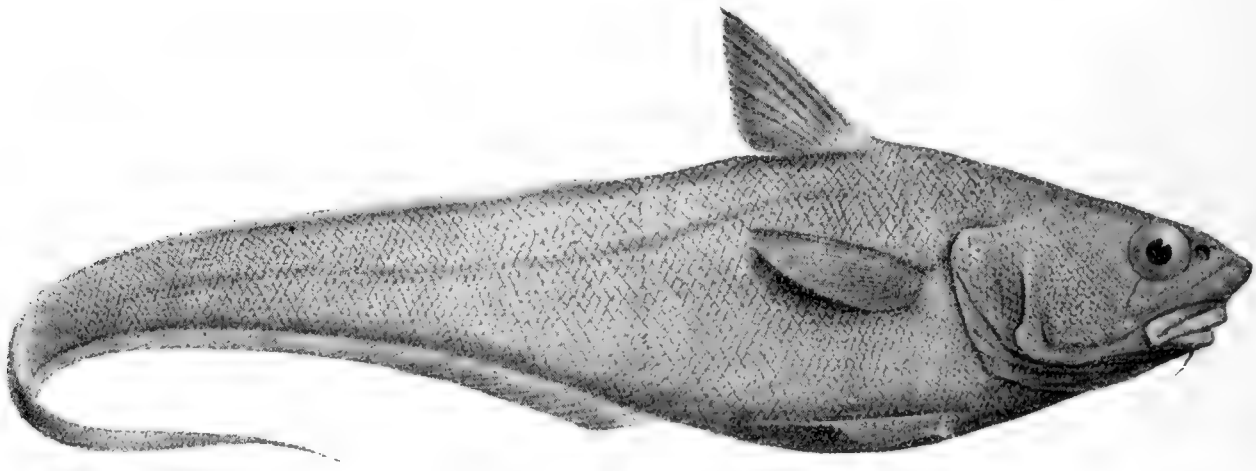


Fig. 99. *Nematonurus armatus.*

This and the following species are known only from very deep water.

OPTONURUS Günther, 1887 (denticulatus).

OPTONURUS DENTICULATUS Richardson.

Macrourus denticulatus Rich., Zool. Ereb. & Terr., 1848, p. 53, pl. xxxii, fig. 1-3.
Coryphaenoides denticulatus Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 396.
Optonurus denticulatus Günth., Chall. Rep., xxii, 1887, p. 147.

FAMILY GADIDAE.

LOTELLA Kaup, 1858 (phycis).

LOTELLA CALLARIAS Günther (Beardie).

Lotella callarias Günth., A.M.N.H. (3), xi, 1863, p. 116; McCoy, Prod. Zool. Viet., dec. ii, 1878, pl. xix; Ogil., Edib. Fish. N.S.W., 1893, p. 152, pl. xxxvii; Roughley, Fish. Aust., 1916, p. 47, pl. x.
Lotella schuettei Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 466, pl. iii, fig. 1.
Lotella marginata Macl., P.L.S., N.S.W., vi, 1881, p. 114 (not Günth, 1878).
Lotella swanii Johnston, P.R.S., Tasm., 1883, p. 126.
Lotella limbata Ogil., Cat. Fish. N.S.W., 1886, p. 47.

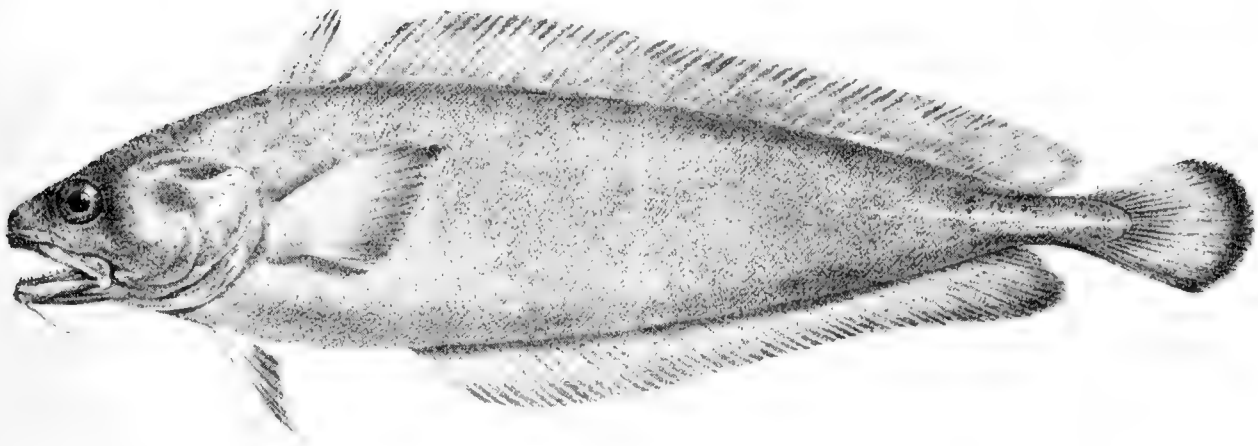


Fig. 101. *Lotella caliarias.*

Not regarded as a prime fish; the flesh is rather soft and of poor keeping quality.

PHYSICULUS Kaup, 1858 (dalwigkii).

PHYSICULUS BARBATUS Günther (Cod).

Pseudophysis barbatus Günth., A.M.N.H. (3), xi, 1863, p. 116; McCoy, Prod. Zool. Vict., dec. ii, 1878, pl. xx.

Physiculus palmatus Klunz., Arch. f. Naturg., xxxviii, 1872, p. 38.

Lotella grandis Rams., P.L.S., N.S.W., v, 1881, p. 462.

Physiculus barbatus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 24.

Physiculus bachus Stead, Edib. Fish. N.S.W., 1908, pl. xvi (not Forst.).

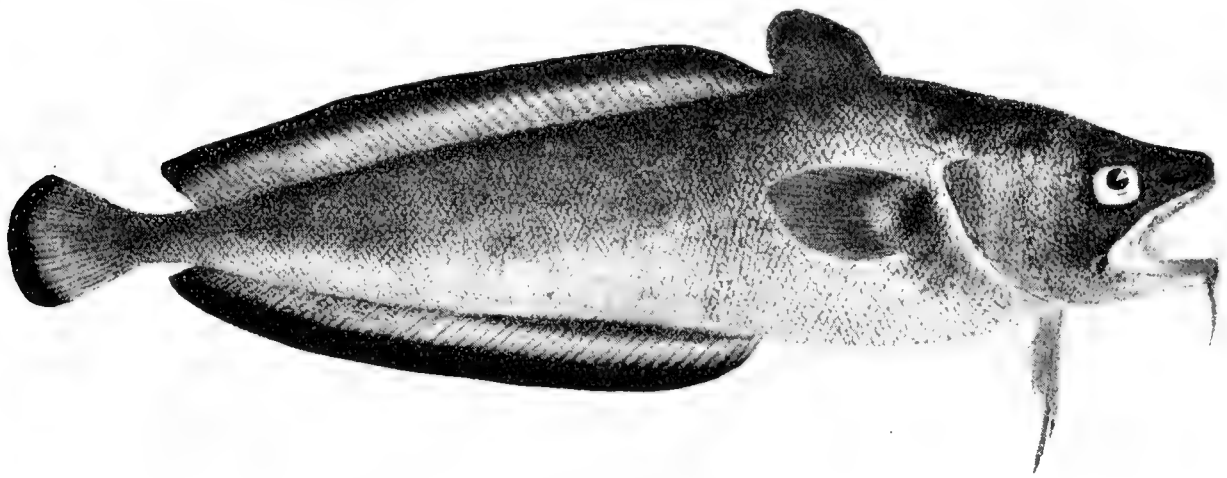


Fig. 102. *Physiculus barbatus.*

"The flesh is soft and not very good."

PHYSICULUS BACHUS Forster (Red Cod).

Lota bachus Forst., in Bloch & Schneid., Syst. Ichth., 1801, p. 53.

Lota breviuscula Rich., Zool. Ereb. & Terr., 1848, p. 61, pl. xxxviii, fig. 1, 2.
Physiculus bachus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 24 and Rec. Cant. Mus., i, 1911, p. 183, pl. xxxi, fig. 1.

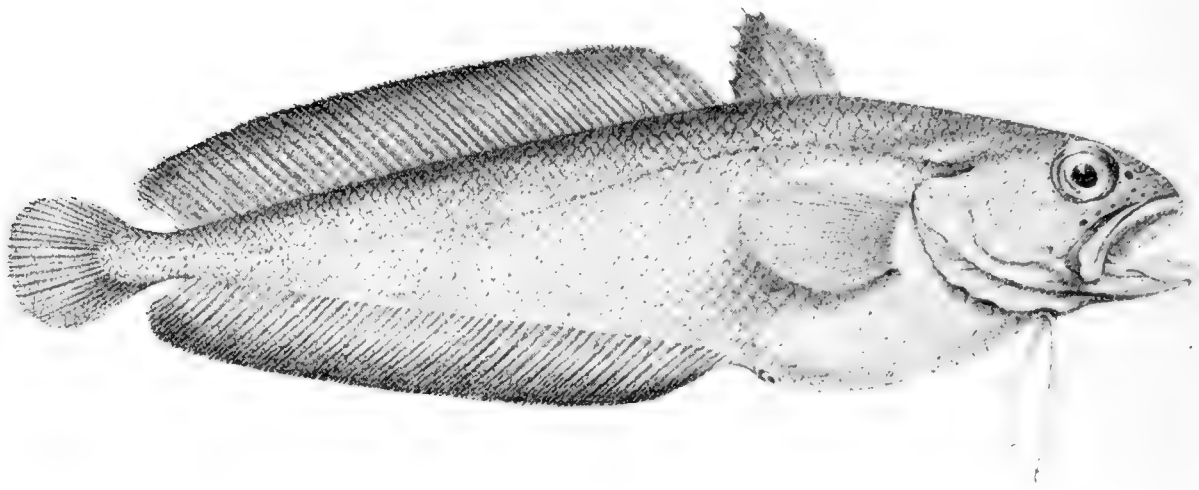


Fig. 103. *Physiculus bachus.*

Not recognized by fishermen as distinct from the foregoing.

ORDER BERYCOMORPHI.

FAMILY BERYCIDAE.

TRACHICHTHODES Gilchrist, 1903 (spinosus).

TRACHICHTHODES LINEATUS Cuvier & Valenciennes (Swallow-tail).

Beryx lineatus Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 226, pl. lx.
Beryx mulleri Klunz., Sitz. Akad. Wiss. Wien, lxxx, 1880, p. 359, pl. iii, fig. 1.

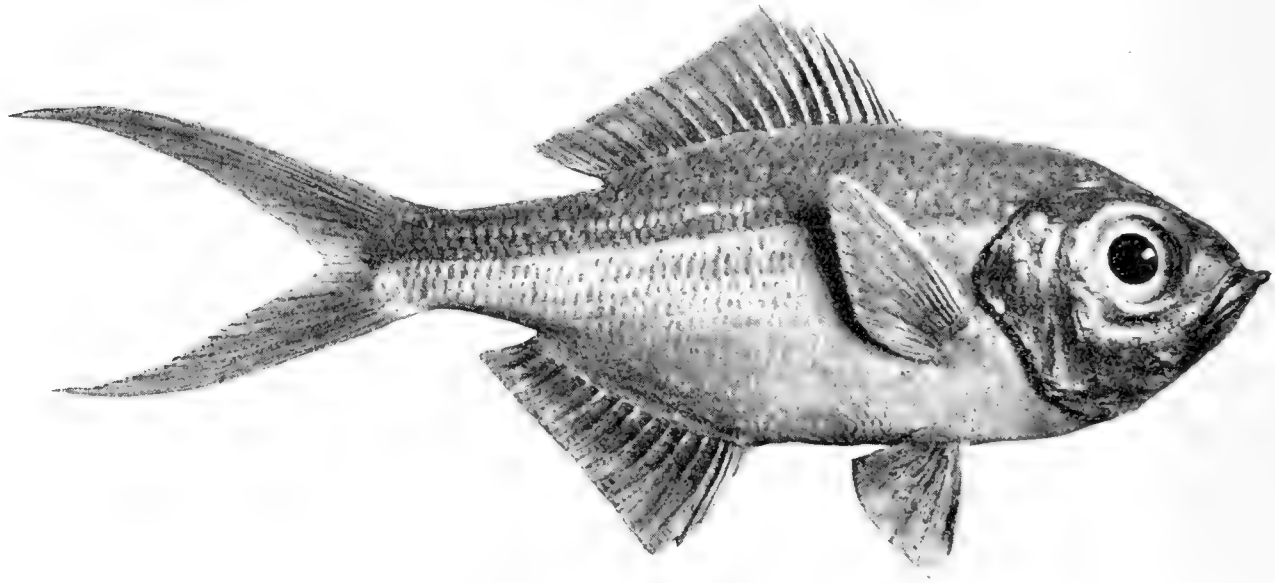


Fig. 104. *Trachichthodes lineatus.*

Trachichthodes lineatus Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 461, fig. (head).

An excellent and much esteemed food fish. The commonest fish taken on the "Simplon" trawling cruise, 1914, 700 lb. weight being netted in one haul.

TRACHICHTHODES AFFINIS Günther (Nannygai).

Beryx affinis Günth., Cat. Fish. Brit. Mus., i, 1859, p. 13 and A.M.N.H. (5), xx, 1887, p. 238, fig. (snout); Ogil., Edib. Fish. N.S.W., 1893, p. 69, pl. xxi; Stead, Edib. Fish. N.S.W., 1908, p. 48, pl. xvii.
Hoplopteryx affinis Regan, A.M.N.H. (8), vii, 1911, p. 5, pl. i.
Austroberyx affinis McCull., Endeavour Res., i, 1911, p. 43, fig. 11.
Trachichthodes affinis Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 463; Roughley, Fish. Aust., 1916, p. 49, pl. xi.

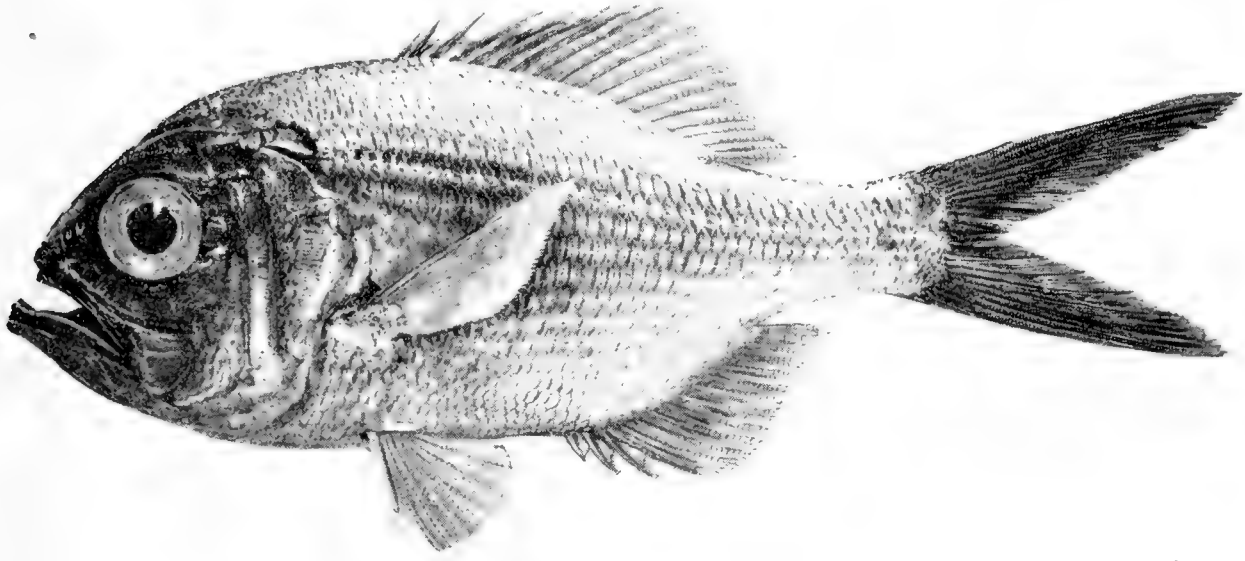


Fig. 105. *Trachichthodes affinis.*

The eastern representative of our Red Snapper, but recorded from South Australia.

TRACHICHTHODES GERRARDI Günther (Red Snapper).

Beryx gerrardi Günth., A.M.N.H. (5), xx, 1887, p. 238, fig. (snout).
Austroberyx gerrardi McCull., Endeavour Res., i, 1911, p. 41, pl. viii.
Trachichthodes gerrardi Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 463.

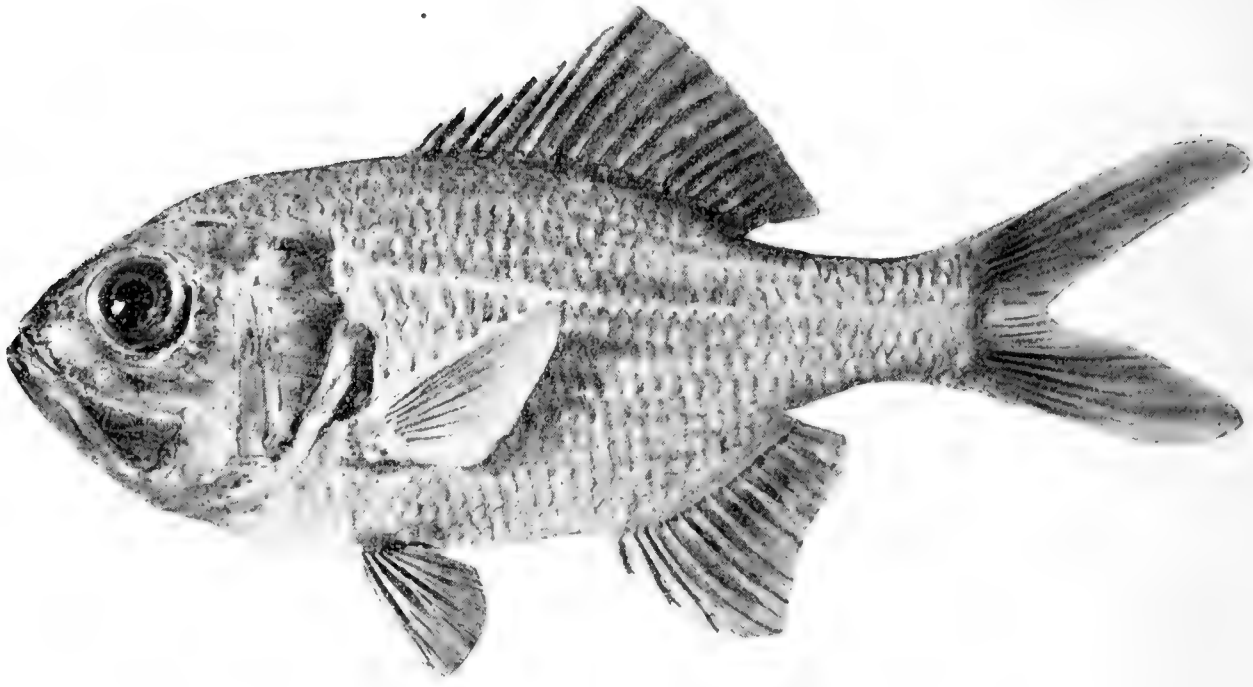


Fig. 106. *Trachichthodes gerrardi.*

An excellent and highly esteemed food fish, scarcely distinguishable from the Nannygai. All three species of the genus are of beautiful red colour.

FAMILY TRACHICHTHYIDAE.

HOPLOSTETHUS Cuvier & Valenciennes, 1829 (mediterraneus).

HOPLOSTETHUS MEDITERRANEUS Cuvier & Valenciennes.

Hoplostethus mediterraneus Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 469, pl. xcviii, *bis;* Steind. & Doder., Denks. Akad. Wiss. Wien, xlvii, 1883, p. 218, pl. i; Goode & Bean, Oceanic Ichth, 1895, p. 189, pl. lvi, fig. 208; Alcock, Illus. Zool. Investigator, 1895, pl. xiv, fig. 3.

Trachichthys pretiosus Lowe, P.Z.S., 1839, p. 77.

Hoplostethus japonicus Hilgend., Sitzb. Ges. Naturf. Freunde, Berlin, 1879, p. 78.

Hoplostethus mediterraneus var. *latus* McCull., Endeavour Res., ii, 1914, p. 97, fig. 5.

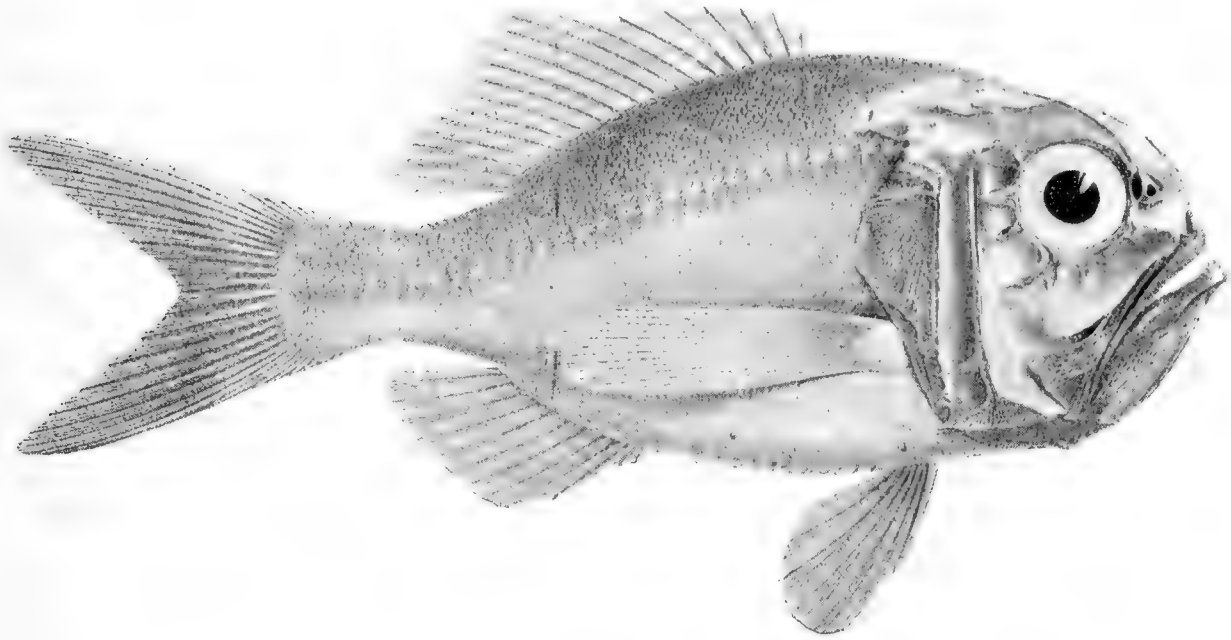


Fig. 107. *Hoplostethus mediterraneus.*

The fishes of this Family occur in deep water and are not netted for food.

HOPLOSTETHUS INTERMEDIUS Hector.

Trachichthys intermedius Hect., T.N.Z. Inst., vii, 1875, p. 245, pl. xi, fig. 18a; Günth., Chall. Rep., xxii, 1887, p. 24, pl. v, fig. D.
Hoplostethus intermedius McCull., Endeavour Res., ii, 1914, p. 100, fig. 6.

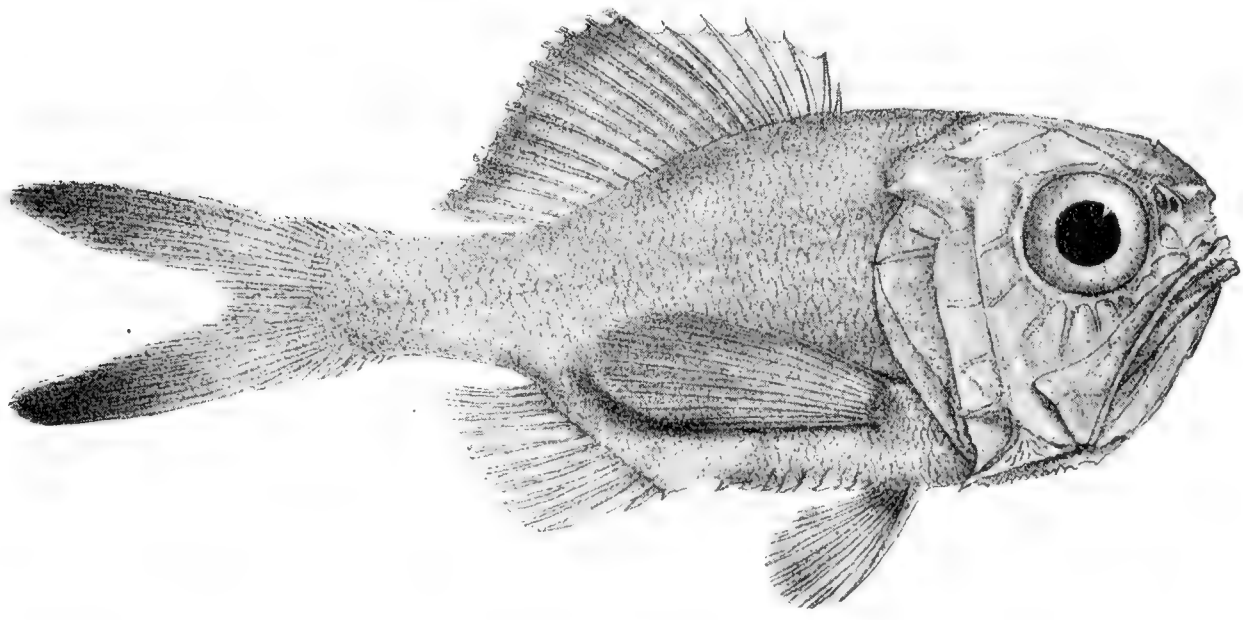


Fig. 108. *Hoplostethus intermedius.*

HOPLOSTETHUS GIGAS McCulloch.

Hoplostethus gigas McCull., Endeavour Res., ii, 1914, p. 101, pl. xix.

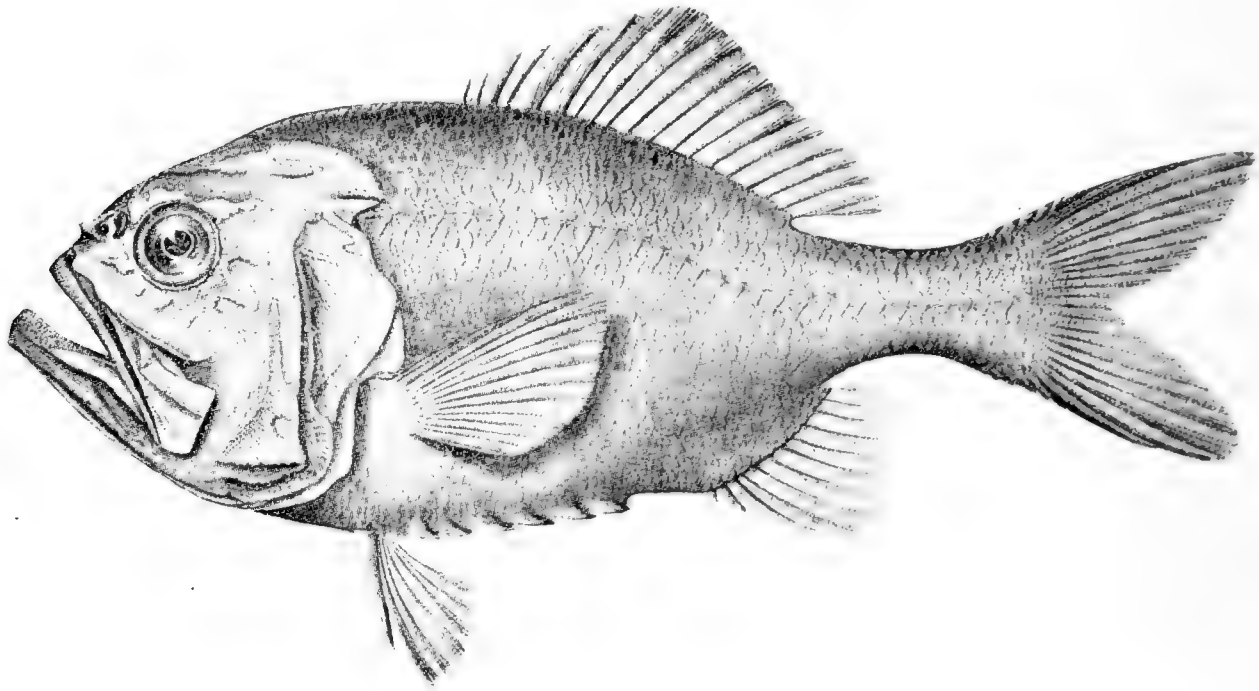


Fig. 109. *Hoplostethus gigas.*

GEPHYROBERYX Boulenger, 1902 (darwinii).

GEPHYROBERYX DARWINII Johnson.

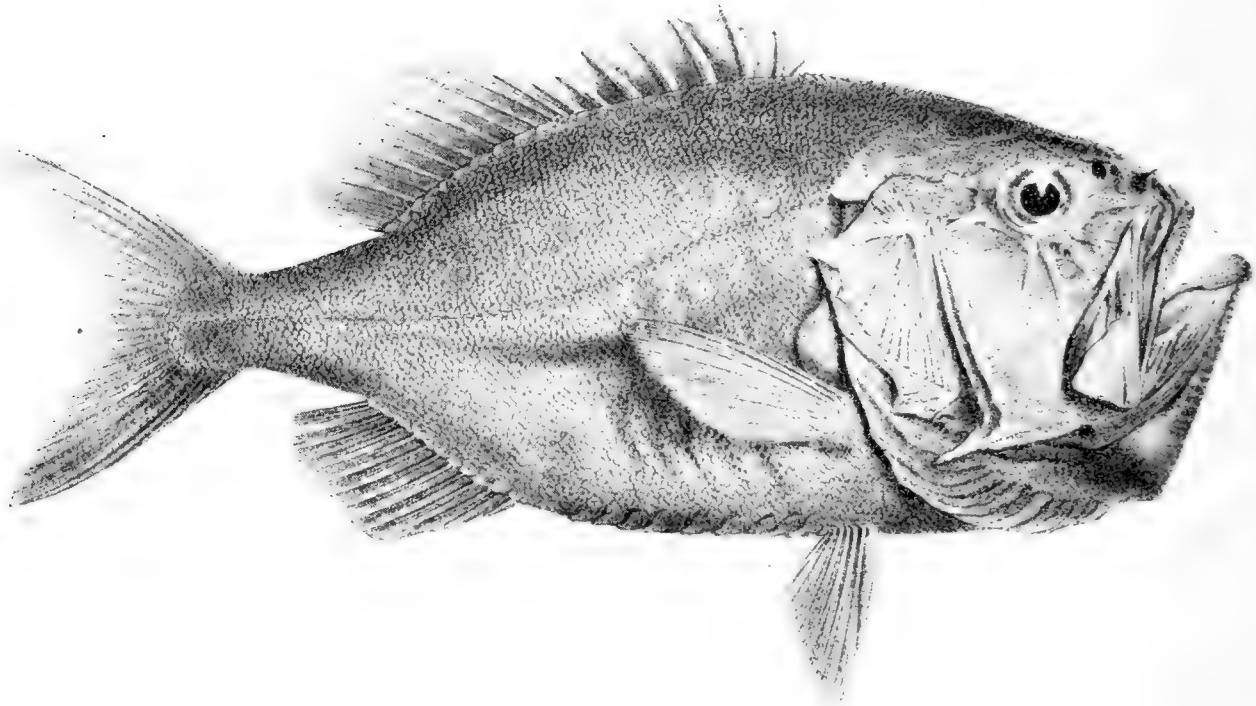


Fig. 110. *Gephyroberyx darwinii.*

Trachichthys darwinii Johnson, P.Z.S., 1866, p. 311, pl. xxxii; Goode & Bean, Oceanic Ichth., 1895, p. 188, pl. lvi, fig. 207.

Gephyroberyx darwinii Boul., A.M.N.H. (7), ix, 1902, p. 203; McCull., Endeavour Res., iv, 1916, p. 182.

PARATRACHICHTHYS Waite, 1899 (trailli).

PARATRACHICHTHYS TRAILLI Hutton.

Trachichthys tralli Hutt., T.N.Z. Inst., viii, 1876, p. 212; Günth., Chall. Rep., xxii, 1887, p. 23, pl. lv., fig. A.

Trachichthys macleayi Johnston, P.R.S., Tasm., 1881, p. 56.

Paratrachichthys trailli Waite, Mem. Austr. Mus., iv, 1890, p. 65.

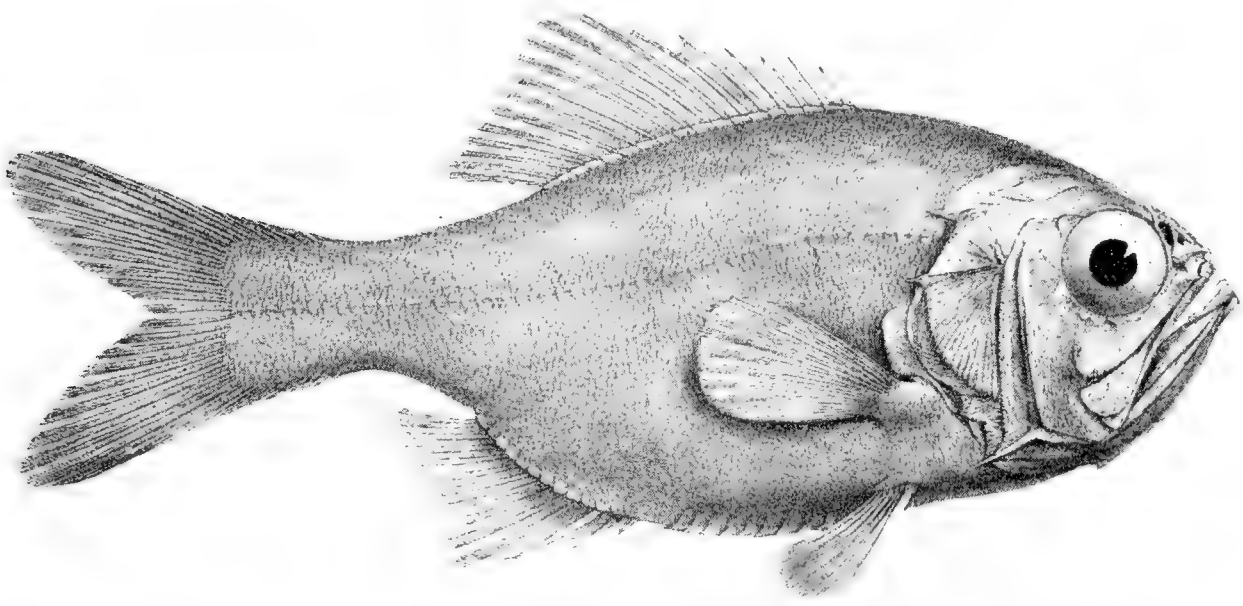


Fig. 111. *Paratrachichthys trailli.*

TRACHICHTHYS Shaw & Nodder, 1799 (australis).

TRACHICHTHYS AUSTRALIS Shaw & Nodder (Roughy).

Trachichthys australis Shaw & Nodder, Nat. Misc., x, 1799, pl. ccclxxviii; McCoy, Prod. Zool. Viet., dec. xii, 1886, pl. cxiv.

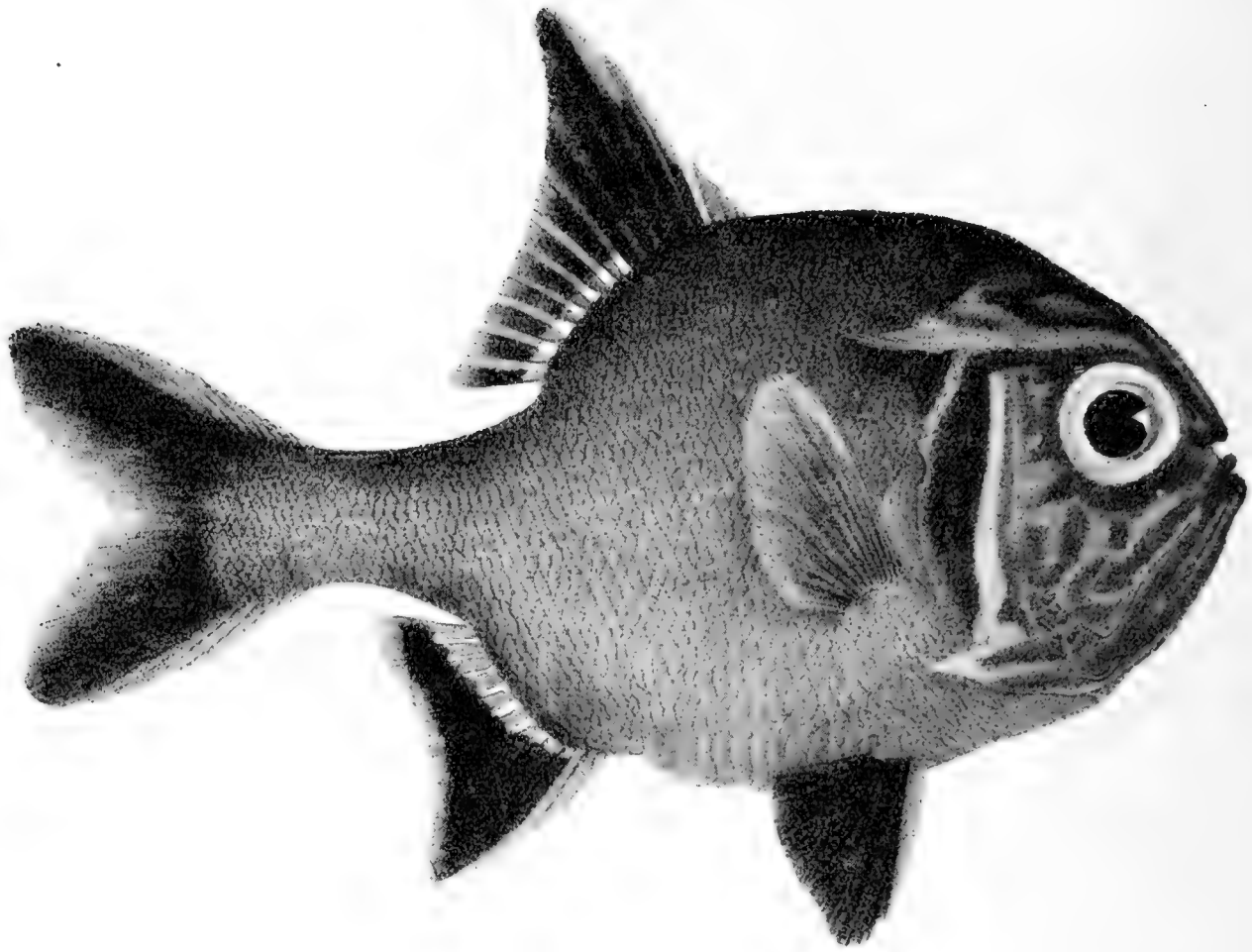


Fig. 112. *Trachichthys australis.*

FAMILY ZEIDAE.

ZEUS Linnaeus, 1758 (faber).

ZEUS FABER Linnaeus (John Dory).

Zeus faber Linn., Syst. Nat. (ed. x), 1758, p. 267; Day, Fish. Gt. Brit. and Irel., i, 1881, p. 138, pl. xlviii; Roughley, Fish. Aust., 1916, p. 168, pl. lviii.
Zeus australis Rich., Zool. Ereb. & Terr., 1845, p. 36, pl. xxv., fig. 1.

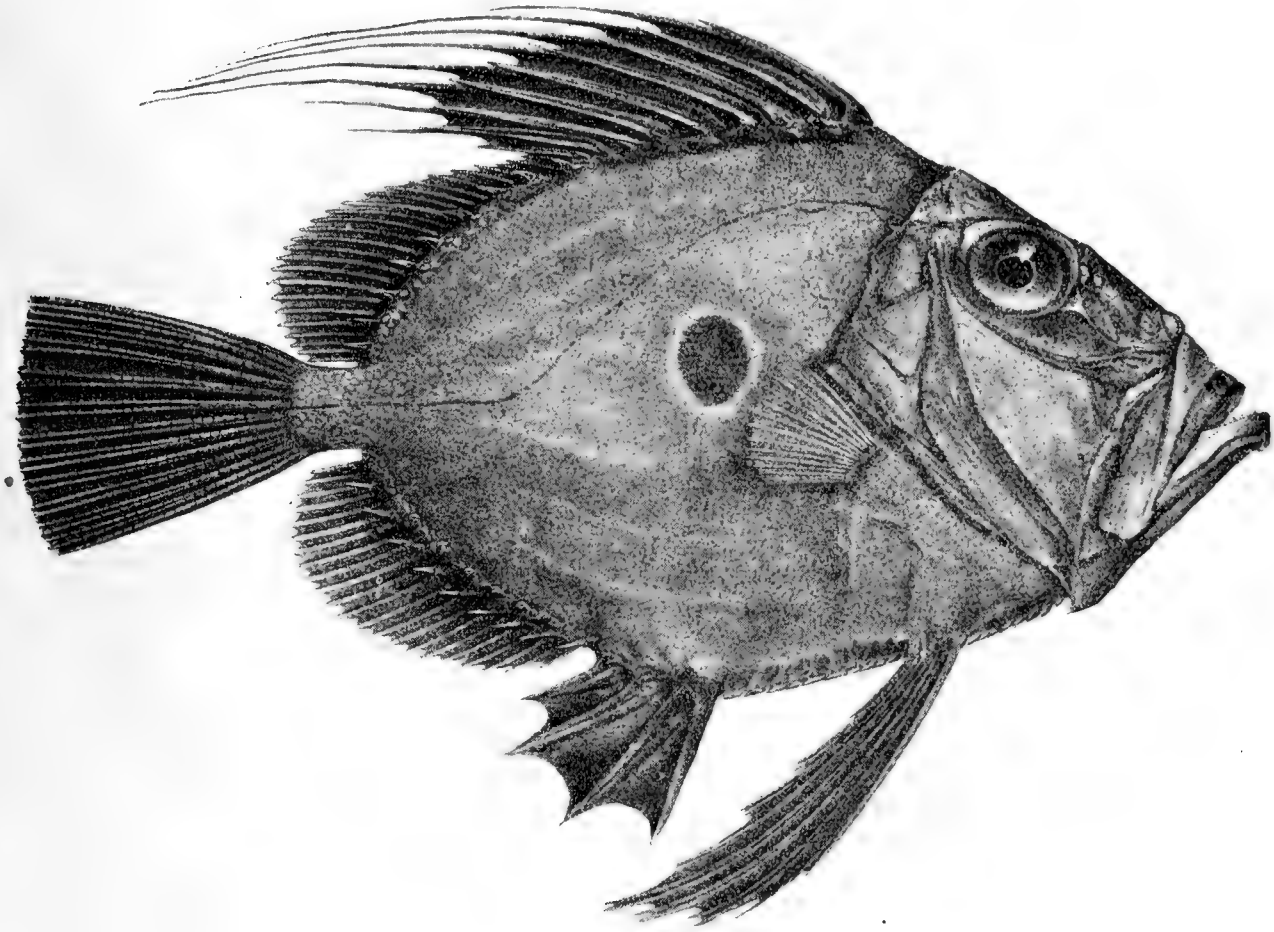


Fig. 113. *Zeus faber.*

A most excellent table fish, seldom seen in the Adelaide market, owing to entire absence of the trawling industry.

FAMILY CYTTIDAE.

CYTTUS Günther, 1860 (australis).

CYTTUS AUSTRALIS Richardson (Silver Dory).

Capros australis Rich., T.Z.S., iii, 1849, p. 73 and Zool. Ereb. & Terr., 1848, p. 137, pl. lix, fig. 1-5.

Cyttus australis Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 396; Stead, Edib. Fish. N.S.W., 1908, p. 102, pl. lxviii.

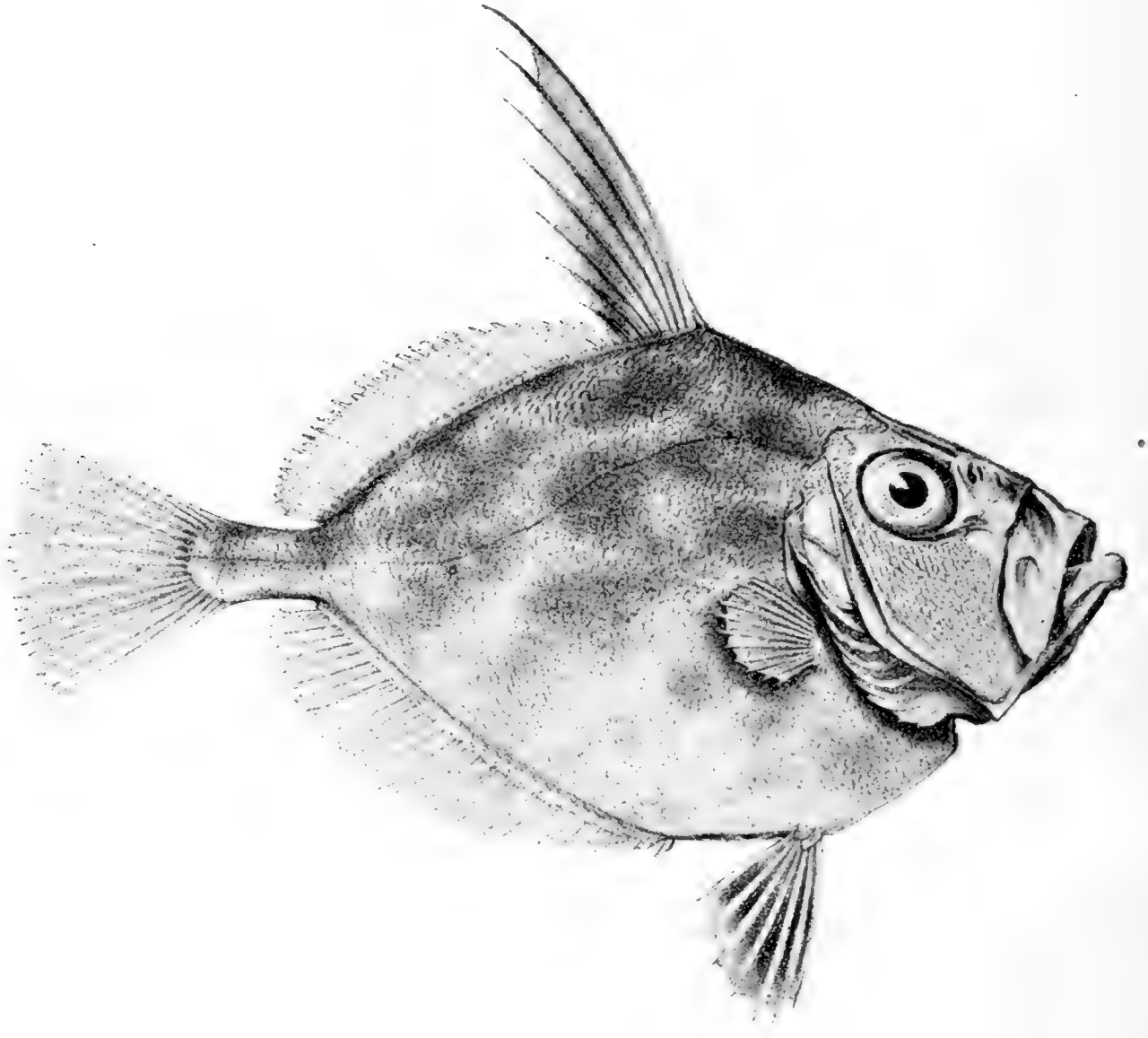


Fig. 114. *Cyttus australis.*

Another good fish which will doubtless be better known when our waters are properly fished.

CYTTOSOMA Gilchrist, 1904 (boops).

CYTTOSOMA BOOPS Gilchrist (Ox-eyed Dory).

Cyttosoma boops Gilch., Mar. Invest. S. Afric., iii, 1904, p. 6, pl. xxiii; McCull., Endeavour Res., ii, 1914, p. 113.

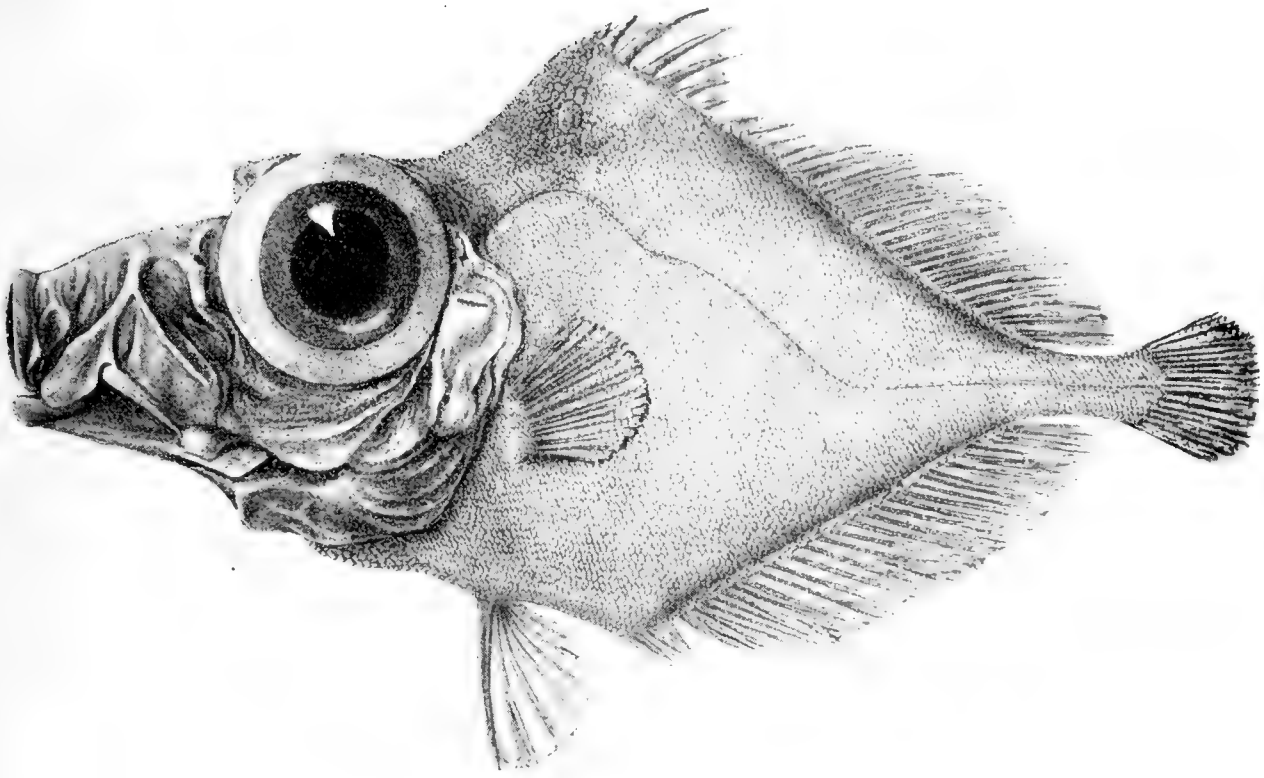


Fig. 115. *Cyttosoma boops.*

Likewise awaiting the advent of the trawl. Specimens were taken by the "Simplon" in 1914, in 80-140 fathoms, and previously by the "Endeavour" in still deeper water, all obtained in the Great Australian Bight.

NEOCYTTUS Gilchrist, 1907 (rhomboidalis).

NEOCYTTUS RHOMBOIDALIS Gilchrist.

Neocyttus rhomboidalis Gilch., Mar. Invest. S. Afric., iv, 1907, p. 153, pl. xlii.

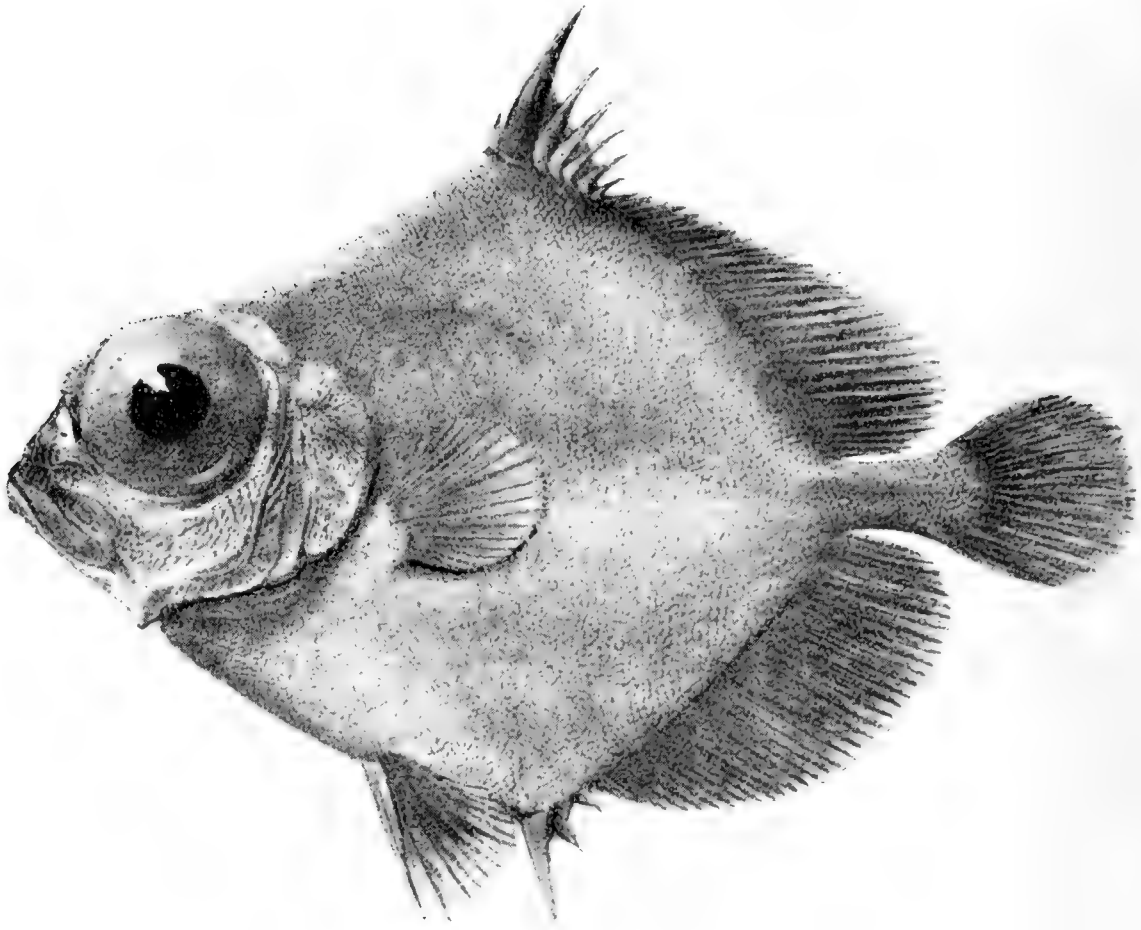


Fig. 116. *Neocyttus rhomboidalis.*

South Australian specimens are referred to a variety, as below.

var. GIBBOSUS McCulloch.

Neocyttus rhomboidalis var. *gibbosus* McCull., Endeavour Res., ii, 1914, p. 119, fig. 8.

Typical forms of this and the following species were first described from South Africa. Australian representatives were secured in the Great Australian Bight by the "Endeavour" in 350-450 fathoms.

ALLOCYTTUS McCulloch, 1914 (verrucosus).

ALLOCYTTUS VERRUCOSUS Gilchrist.

Orcosoma sp. Boul., Compt. Rendu, Acad. Sci. Paris, cxxxvii, 1903, p. 523.
Cyttosoma verrucosum Gilch., Mar. Invest. S. Afric., iv. 1908, p. 151, pl. xl.

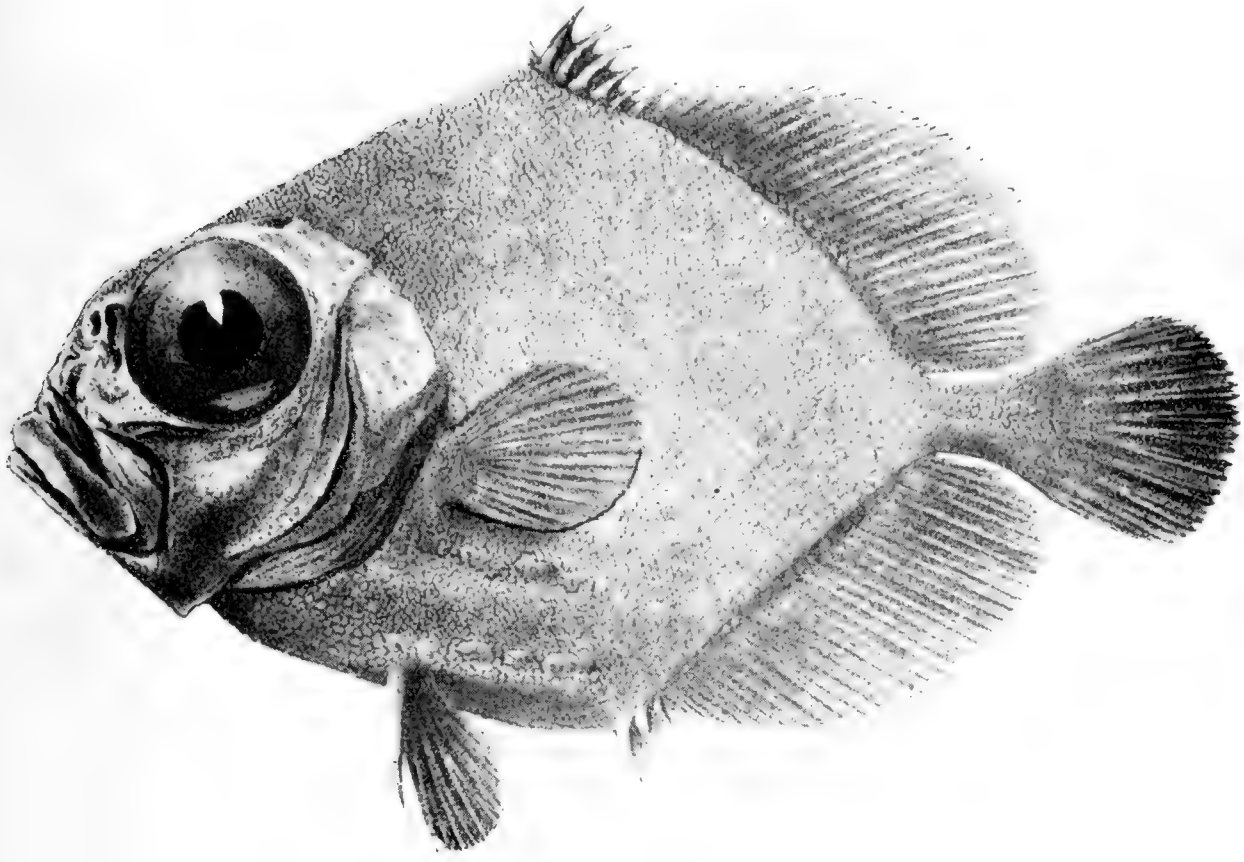


Fig. 117. *Allocyttus verrucosus.*

South Australian specimens are referred to a variety, as below.

var. PROPINQUUS McCulloch.

Allocyttus verrucosus var. *propinquus* McCull., Endeavour Res., ii, 1914, p. 116, fig. 7.

ORDER PERCOMORPHI.

SUB-ORDER PERCESOCES.

FAMILY ATHERINIDAE.

CRATEROCEPHALUS McCulloch, 1912 (fluviatilis).

CRATEROCEPHALUS FLUVIATILIS McCulloch (Fresh-water Hardyhead, Parli).

Craterocephalus fluviatilis McCull., P.R.S., Qld., xxiv., 1912, p. 49, pl. i, fig. 1.

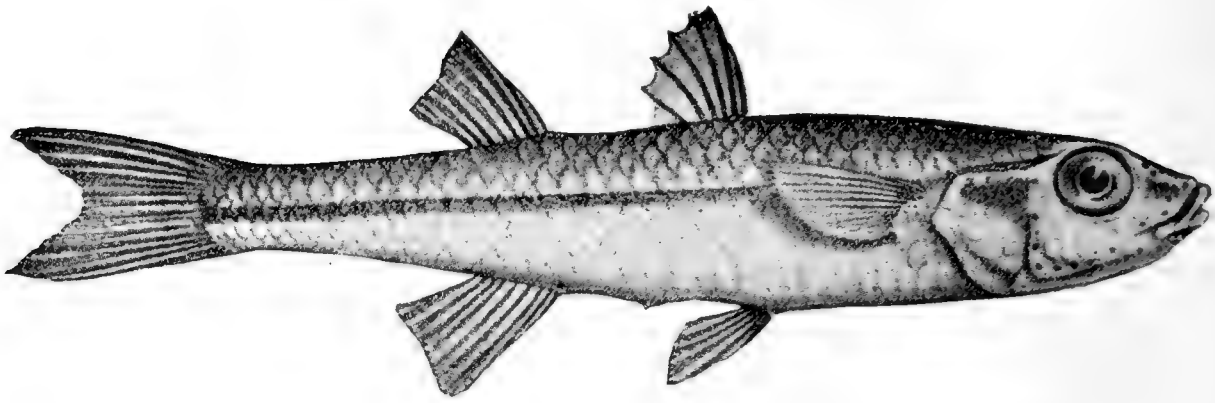


Fig. 118. *Craterocephalus fluviatilis.*

The members of this Family are small fishes of no commercial value.

CRATEROCEPHALUS EYRESII Steindachner.

Atherinichthys eyresii Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 194 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1075.
Atherina interioris Zietz, T.R.S., S.A., xxxiii, 1909, p. 264 *(nom. nud.).*
Craterocephalus eyresii McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 43, fig. 27.

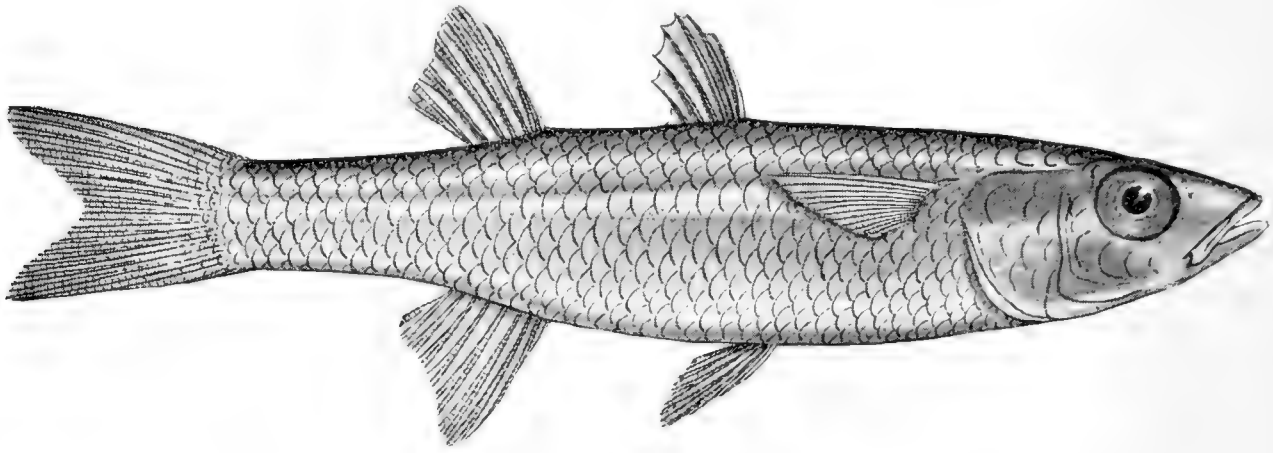


Fig. 119. *Craterocephalus eyresii.*

ATHERINA Linnaeus, 1758 (hepsetus).

ATHERINA TAMARENSIS Johnston.

Atherina tamarensis Johnston, P.R.S., Tasm., 1883, p. 122.
Atherina tasmaniensis Macl., P.L.S., N.S.W., ix, 1884, p. 443.
Atherinichthys cephalotes Zietz, T.R.S., S.A., xxxiii, 1909, p. 264 (not Cast.).
Taeniomembras tamarensis McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 41.

ATHERINA DANNEVIGI McCulloch.

Atherina hepsetus Günth., A.M.N.H. (4), xvii, 1876, p. 396 (not Linn.).
Atherina dannevigi McCull., Endeavour Res., i, 1911, p. 31, pl. xvi, fig. 2.

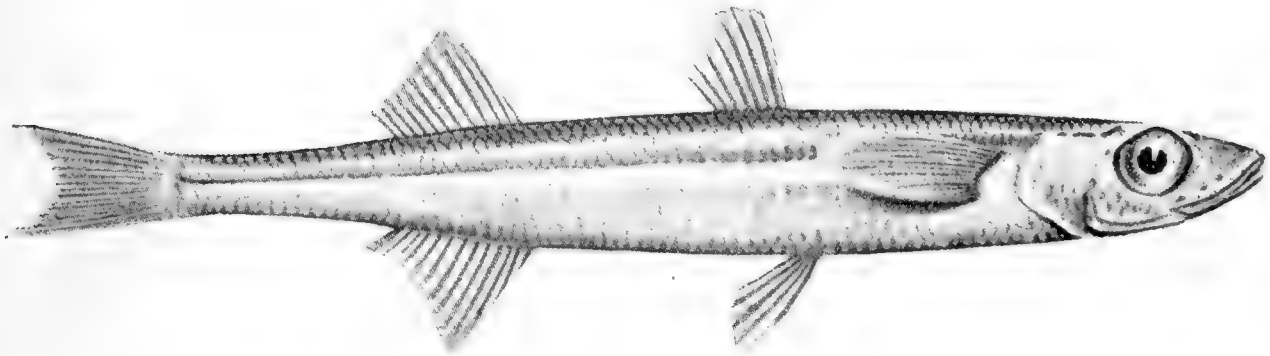


Fig. 121. *Atherina dannevigi.*

HEPSETIA Bonaparte, 1837 (boyeri).

HEPSETIA PINGUIS Lacepède (Hardyhead).

Atherina pinguis Lacep., Hist. Nat. Poiss., v, 1803, p. 371, pl. xi, fig. 1; Ogil., Mem. Qld. Mus., i, 1912, p. 38, pl. xii, fig. 1.

Atherinichthys modesta, A. picta and *A. cephalotes* Cast., P.Z.S., Vict., i, 1872, p. 136, 137.

Atherina lacunosa Günth., Journ. Mus. Godeff., xiii, 1877, p. 213, pl. cxviii, fig. E (not Forst.).

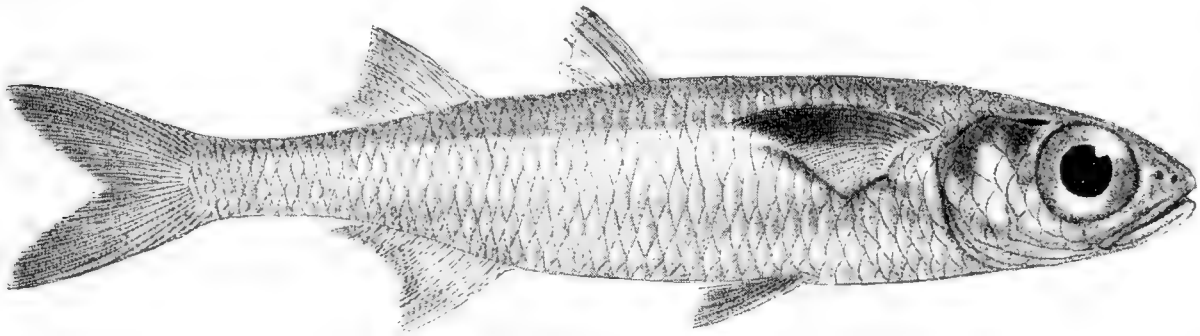


Fig. 122. *Hepsetia pinguis.*

FAMILY MELANOTAENIIDAE.

MELANOTAENIA Gill, 1862 (nigrans).

MELANOTAENIA NIGRANS Richardson (Pink ear).

Atherina nigrans Rich., A.M.N.H., xi, 1843, p. 180.

Melanotaenia nigrans Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. 280.

Nematocentris splendida Peters, Monatsb. Akad. Wiss. Berlin, 1866, p. 516.

Strabo nigrofasciatus Kner & Steind., Sitzb. Akad. Wiss. Wien, liv, 1866, p. 373, 395, pl. iii, fig. 10.

Zanteela pusilla Cast., P.Z.S., Vict., ii, 1873, p. 88.

Aida inornata Cast., Res. Fish. Aust., 1875, p. 10.

Neoatherina australis Cast., Res. Fish. Aust., 1875, p. 32.

Aristeus fitzroyensis, *A. fluviatilis* and *Atherinichthys duboulayi* Cast., P.L.S., N.S.W., iii, 1878, p. 141, 143.

Aristeus rufescens and *A. lineatus* Macl., P.L.S., N.S.W., v, 1881, p. 625.

Aristeus cavifrons Macl., *op. cit.* vii, 1882, p. 70.

Aristeus perporosus De Vis, P.L.S., N.S.W., ix, 1884, p. 694.

Aristeus loriae Perugia, Ann. Mus. Genova (2), xiv, 1894, p. 549.

Nematocentris tatei and *N. winneckei* Zietz, Rep. Horn Exped., ii, 1896, p. 178, 179, pl. xvi, fig. 2, 3.

Melanotaenia maculata Weber, Nova Guinea, v, 1908, p. 239, pl. xi, fig. 4.

Melanotaenia ogilbyi Weber, Notes Leyden Mus., xxxii, 1910, p. 230.

Rhombatractus patoti Weber, Abh. Senckenb. Nat. Ges., xxxiv, 1911, p. 26, pl. i, fig. 3.

*Melanotaenia macculloch*i Ogil., Mem. Qld. Mus., iii, 1915, p. 118, pl. xxix, fig. 1.

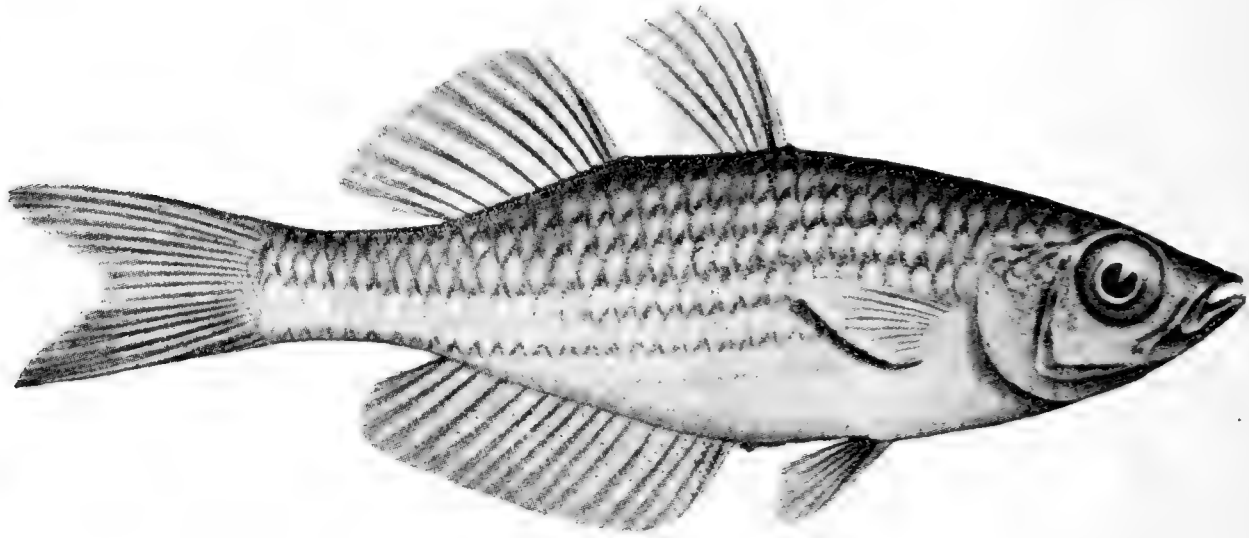


Fig. 123. *Melanotaenia nigrans.*

A small fresh-water fish, admirably suited for the aquarium.

FAMILY MUGILIDAE.

MUGIL Linnaeus, 1858 (cephalus).

MUGIL ARGENTEUS Quoy & Gaimard (Jumping Mullet, Wankari).

Mugil argenteus Quoy & Gaim., Voy. Uran. & Physic., Poiss., 1825, p. 338, pl. lix, fig. 3.

Mugil peronii Cuv. & Val., Hist. Nat. Poiss., xi, 1836, p. 138; Ogil., Edib. Fish. N.S.W., 1893, p. 126, pl. xxxii; Stead, Edib. Fish. N.S.W., 1908, p. 42, pl. xiii; Roughley, Fish. Aust., 1916, p. 41, pl. viii.

Mugil ferrandi Cuv. & Val., *op. cit.*, p. 142.

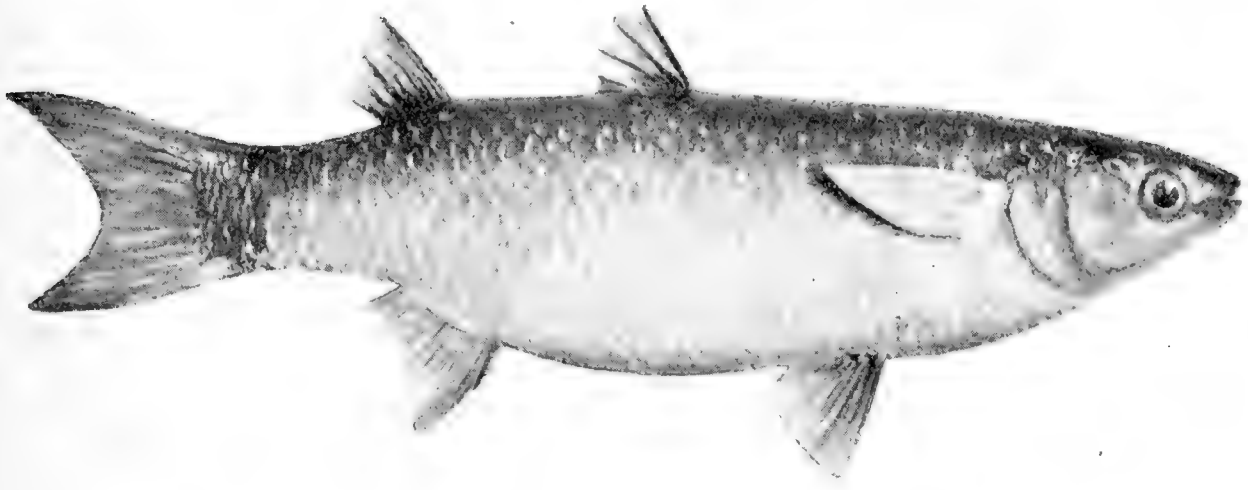


Fig. 124. *Mugil argenteus.*

The Flat-tailed Mullet of the eastern States, plentiful and good-eating, but not so esteemed as the next species.

MUGIL DOBULA Günther (Sea Mullet).

Mugil dobula Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 420, fig. (head) and Fische Südsee, ii, 1877, p. 214, pl. cxx, fig. A (head); Ogil., Edib. Fish. N.S.W., 1893, p. 118, pl. xxxi; Stead, Edib. Fish. N.S.W., 1908, p. 40, pl. xii; Roughley, Fish. Aust., 1916, p. 37, pl. vii.

Mugil waigiensis Cast., P.Z.S., Vict., i, 1872, p. 140 (not Quoy & Gaim.).

Mugil grandis Cast., P.L.S., N.S.W., iii, 1879, p. 386.

Mugil cephalotus Johnston, P.R.S., Tasm., 1883, p. 122 (not Cuv. & Val.).

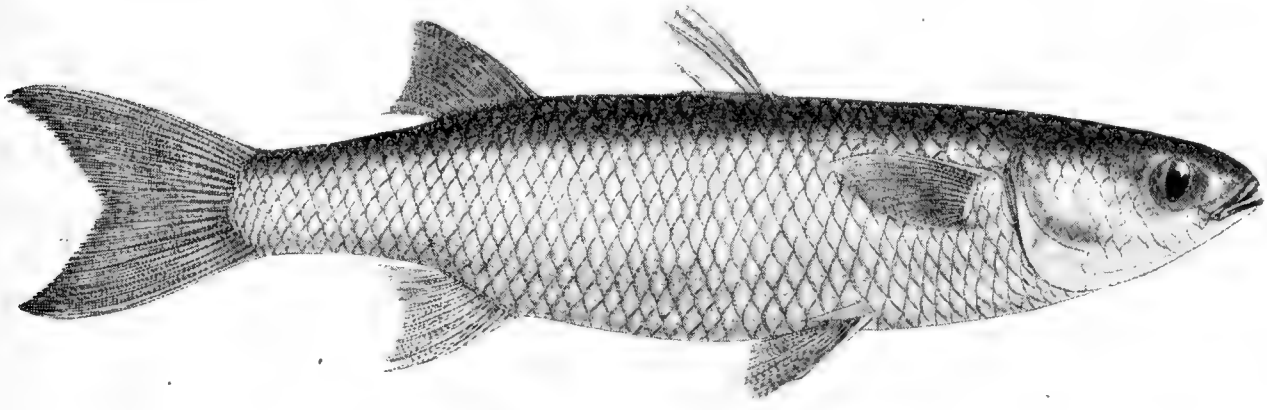


Fig. 125. *Mugil dobula.*

One of the most important food fishes of the Commonwealth, plentiful throughout the year.

AGONOSTOMUS Bennett, 1830 (telfari).

AGONOSTOMUS FORSTERI Bloch & Schneider (Fresh-water Mullet, Conmuri).

Albula forsteri Bl. & Schn., Syst. Ichth, 1801, p. xxxii and 120.

Dajaus diemensis Rich., P.Z.S., 1840, p. 25 and Zool. Ereb. & Terr., 1845, p. 37, pl. xxvi, fig. 1, 2.

Dajaus forsteri Rich., Zool. Ereb. & Terr, 1847, p. 77, pl. xliv, fig. 20-26 (young).

Agonostoma forsteri Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 465.

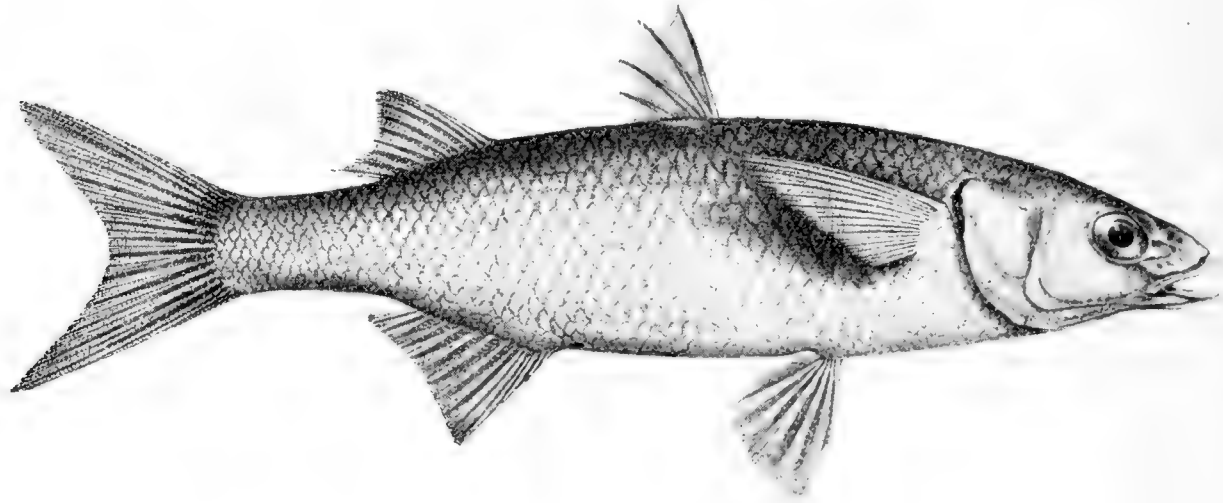


Fig. 126. *Agonostomus forsteri.*

Widely distributed, but of small economic value.

MYXUS Günther, 1861 (elongatus).

MYXUS ELONGATUS Günther (Sand Mullet).

Myxus elongatus Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 466; Ogil., Edib. Fish. N.S.W., 1893, p. 128, pl. xxxiii; Waite, Prelim. Rep. Thetis, 1898, p. 61, pl. xii; Stead, Edib. Fish. N.S.W., 1908, p. 45, pl. xiv; Roughley, Fish. Aust., 1916, p. 43, pl. ix.

Cestraeus norfolcensis Ogil., P.L.S., N.S.W., xxii, 1898, p. 80.

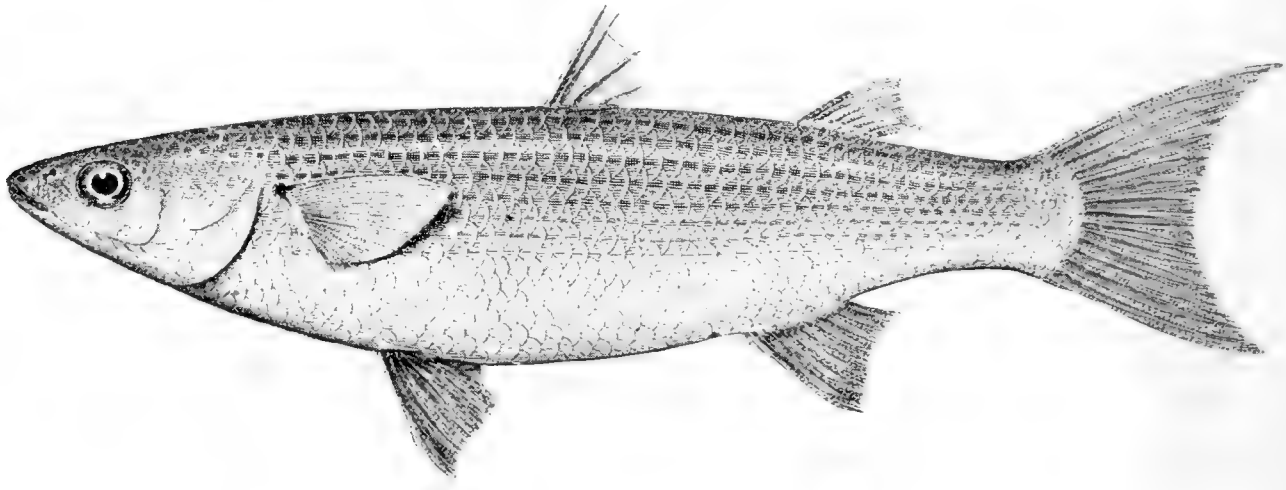


Fig. 127. *Myxus elongatus.*

Though commonly taken and eaten, it is not to be compared with the fish known as Sea Mullet.

FAMILY SPHYRAENIDAE.

SPHYRAENA Rose, 1793 (sphyraena).

SPHYRAENA NOVAE-HOLLANDIAE Günther (Snook, Short-finned Pike).

Sphyraena novae-hollandiae Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 335; Ogil., Edib. Fish. N.S.W., 1893, pl. xxx (description, p. 114, is of *S. waitii* Ogil.); Roughley, Fish. Aust., 1916, p. 45.

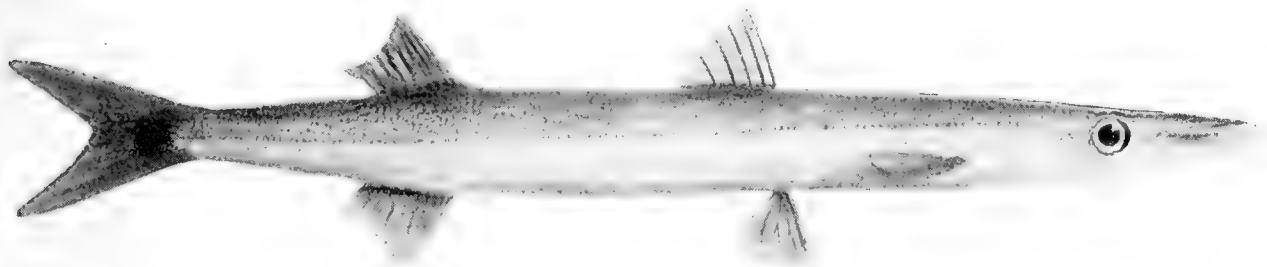


Fig. 128. *Sphyraena novae-hollandiae.*

An excellent table fish, and affords good sport by trailing a lure after a sailing boat. It attains to 3 feet in length.

SPHYRAENA OBTUSATA Cuvier & Valenciennes (Pike).

Sphyraena obtusata Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 350; Günth., Fische Südsee, ii, 1877, p. 212, pl. cxix, fig. B.
Sphyraena flavicauda Rupp., Neue Wirbelt., Fisch., 1835, p. 100, pl. xxv, fig. 3.

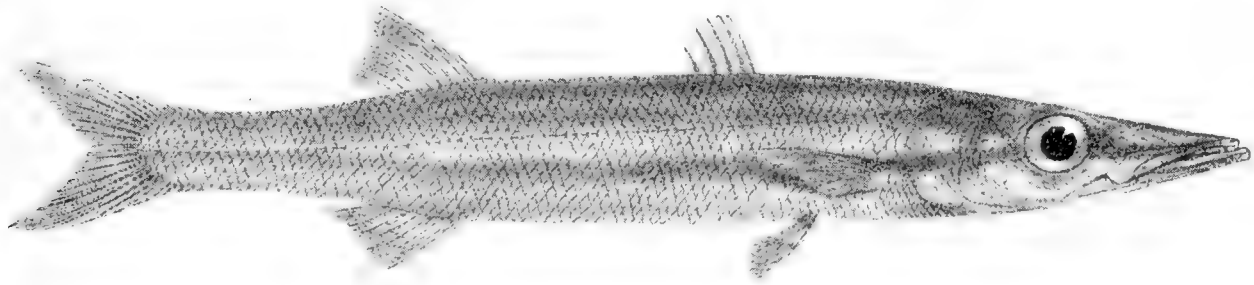


Fig. 129. *Sphyraena obtusata.*

SUB-ORDER STROMATEOIDEA.

FAMILY STROMATEIDAE.

SERIOLELLA Guichenot, 1848 (porosa).

SERIOLELLA BRAMA Günther (Sea Bream).

Neptomenus brama Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 390.
Neptonemus? travale Cast, P.Z.S., Vict., i, 1872, p. 119.
Seriolella brama Regan, A.M.N.H. (7), x, 1902, p. 129; Waite, Rec. Cant. Mus., i, 1911, p. 229, pl. 1; McCull., Endeavour Res., i, 1911, p. 34, pl. ix, fig. 1.

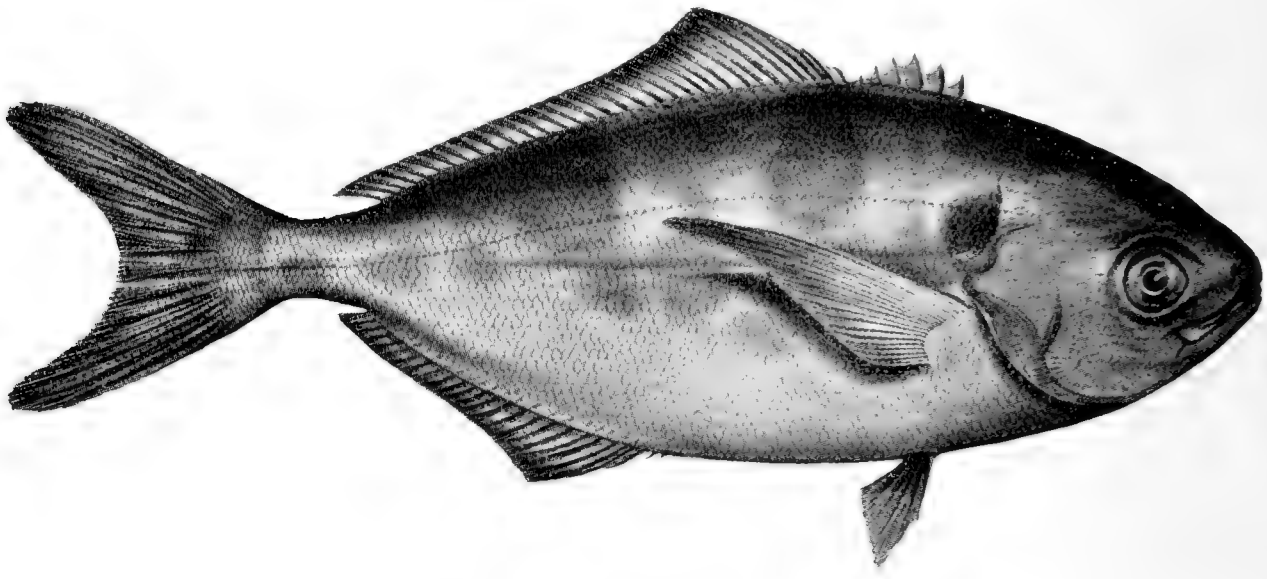


Fig. 130. *Seriolella brama.*

The Warehou of New Zealand, where it is fairly common and esteemed as food.

HYPEROGLYPHE Günther, 1959 (porosa).

HYPEROGLYPHE POROSA Richardson (Deep-sea Trevally).

Diagramma porosa Rich., Zool. Ereb. & Terr., 1845, p. 26, pl. xvi., fig. 5, 6.
Hyperoglyphe porosa Günth., Cat. Fish. Brit. Mus., i, 1859, p. 337.
Eurumetopos johnstonii Morton, P.R.S., Tasm., 1888, p. 77 and plate; Waite, T.N.Z. Inst., xliv, 1912, p. 200, pl. xii.
Schedophilus porosus Waite, Mem. N.S.W. Nat. Club, 1904, p. 24.
Hyperoglyphe johnstonii McCull., Endeavour Res., ii, 1914, p. 95, pl. xviii.

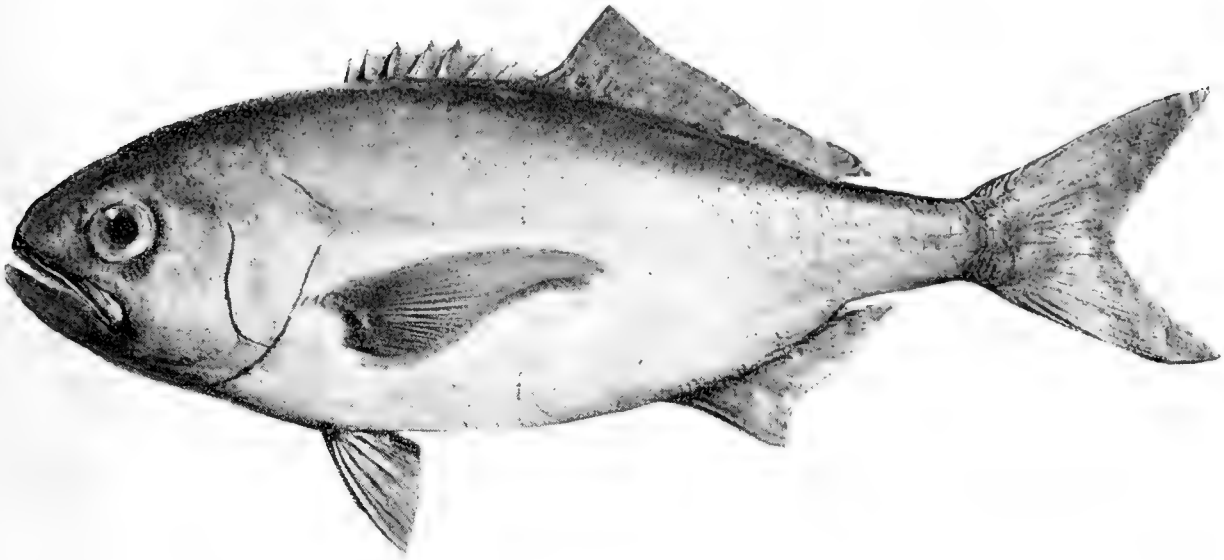


Fig. 131. *Hyperoglyphe porosa.*

A large and excellent fish of erratic occurrence. Large quantities have at times been taken at the Chatham Islands.

SUB-ORDER PERCOIDEA.

DIVISION PERCIFORMES.

FAMILY SERRANIDAE.

PERCALATES Ramsay & Ogilby, 1887 (colonorum).

PERCALATES COLONORUM Günther (Australian Perch, Taralgi).

Lates colonorum Günth., A.M.N.H. (3), xi, 1863, p. 114; McCoy, Prod. Zool. Vict., dec. ii, 1878, pl. xiv.

Dules novem-aculeatus Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 428, pl. ii, fig. 1.

Lates similis, L. antarcticus, and *L. victoriae* Cast., P.Z.S., Vict., i, 1872, p. 44, 45.

Lates curtus Cast., Res. Fish. Aust., 1875, p. 5.

Lates ramsayi Macl., P.L.S., N.S.W., v, 1881, p. 306.

Percalates colonorum Rams. & Ogil., P.L.S., N.S.W. (2), ii, 1887, p. 182; Ogil., Edib. Fish. N.S.W., 1893, p. 2, pl. i; Stead, Edib. Fish. N.S.W., 1908, p. 53, pl. xx.

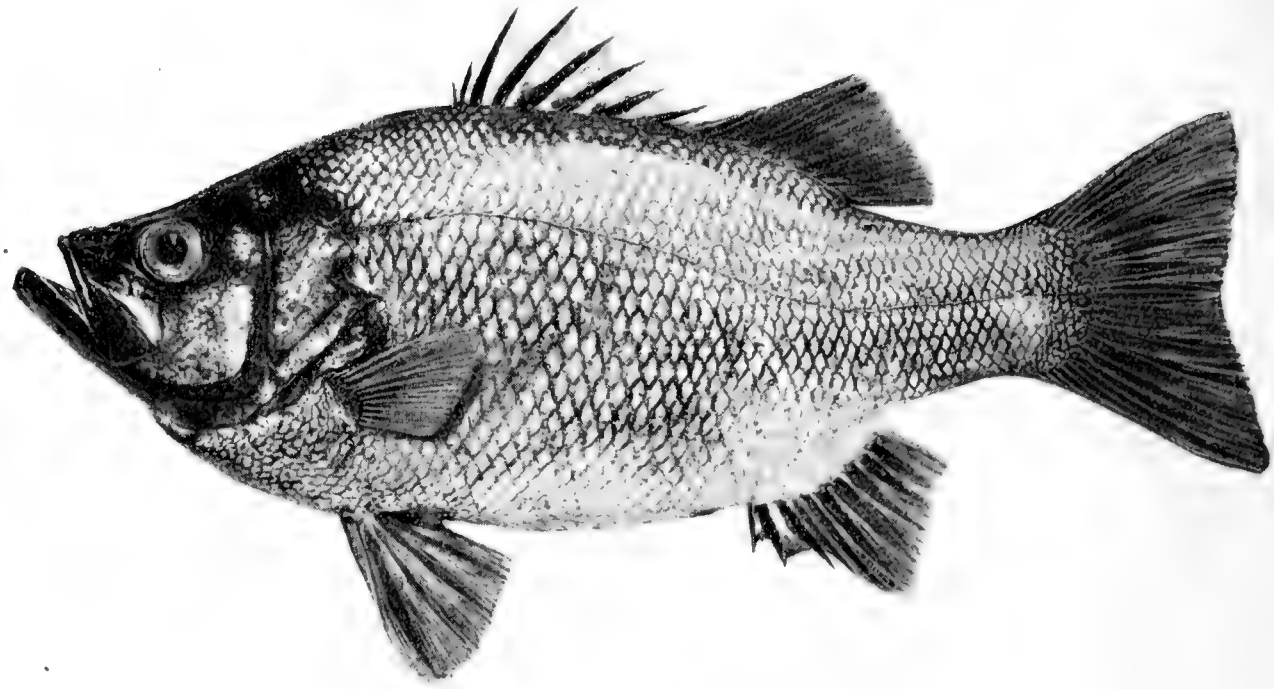


Fig. 132. *Percalates colonorum.*

A good table fish and a favourite with river anglers.

PLECTROPLITES Gill, 1862 (ambiguus).

PLECTROPLITES AMBIGUUS Richardson (Callop, Tarki).

Datnia? ambiguua Rich., Zool. Ereb. & Terr., 1845, p. 25, pl. xix.

Dules ambiguus Günth., Cat. Fish. Brit. Mus., i, 1859, p. 270; Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 348.

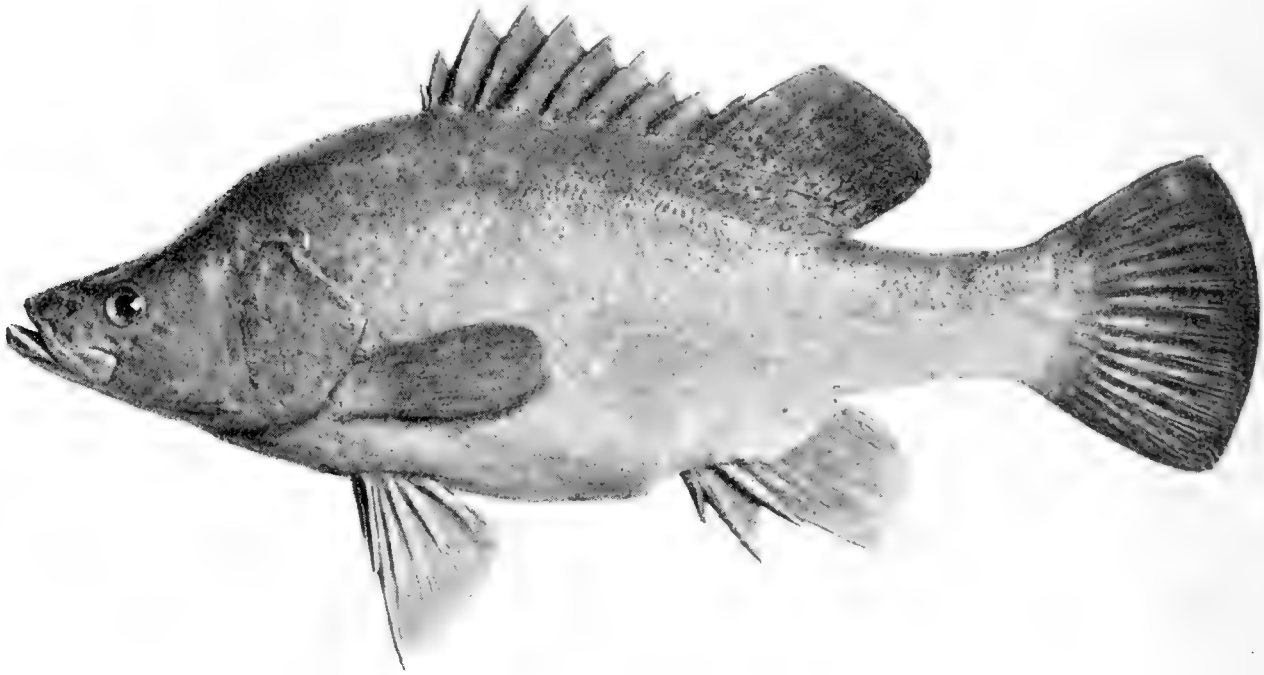


Fig. 133. *Plectroplites ambiguus.*

Plectroplites ambiguus Gill, Proc. Acad. Nat. Sci. Phil., 1863, p. 286; Stead, Edib. Fish. N.S.W., 1908, p. 55, pl. xxiii; Roughley, Fish. Aust., 1916, p. 67, pl. xvii.

Ctenolates macquariensis Günth., P.Z.S., 1871, p. 320, pl. xxxiii.

Dules auratus Cast., P.Z.S., Vict., i, 1872, p. 55.

Dules flavescens Cast., Res. Fish. Aust., 1875, p. 10.

Ctenolates ambiguus Günth., Chall. Rep., i, 1880, p. 32; McCoy, Prod. Zool. Vict., dec: ix, 1884, pl. lxxxiv; Ogil. Edib. Fish. N.S.W., 1893, p. 22, pl. v.

Also known as Murray Perch and Golden Perch. Second only to the Murray Cod as a river fish; by some preferred on account of the less oily nature of the flesh; also esteemed when smoked.

MACQUARIA Cuvier & Valenciennes, 1830 (australasica).

MACQUARIA AUSTRALASICA Cuvier & Valenciennes (Macquarie Perch).

Macquaria australasica Cuv. & Val., Hist. Nat. Poiss., v, 1830, p. 377, pl. cxxxi; Less. & Garn., Voy. Coquille, ii, 1830, p. 194, pl. xiv, fig. 1; Ogil., Edib. Fish. N.S.W., 1893, p. 24, pl. iv.

Dules viverrinus Krefft, P.Z.S., 1867, p. 943.

Murrayia güntheri, M. cyprinoides, and *M. bramoides* Cast., P.Z.S., Vict., i, 1872, p. 61, 62, 63.

Riverina fluviatilis Cast., *op. cit.*, p. 64.

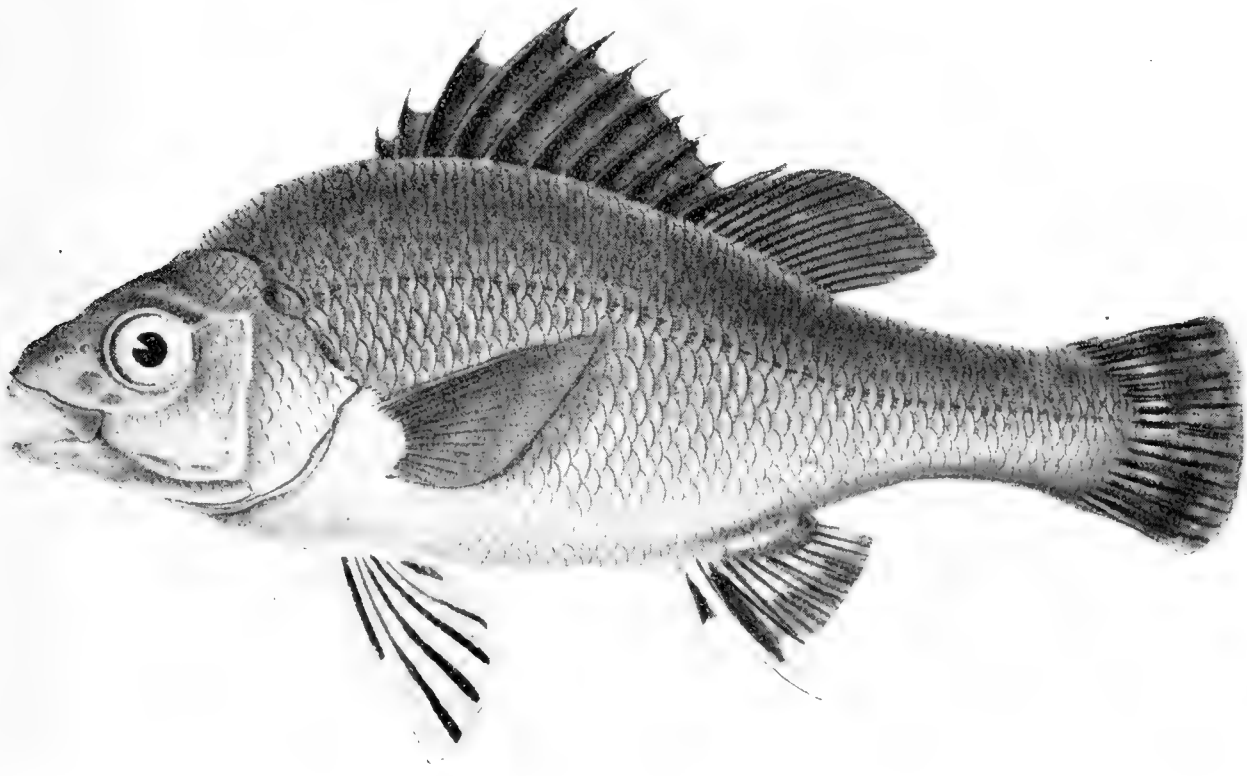


Fig. 134. *Macquaria australasica.*

An excellent table fish, but as with many of our River Murray fish, catches are sent to Melbourne rather than to Adelaide.

OLIGORUS Günther, 1859 (macquariensis).

OLIGORUS MACQUARIENSIS Cuvier & Valenciennes (Murray Cod, Pondi).

Grystes macquariensis Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 58; Guérin, Icon. Règ. Anim. Poiss., 1844, pl. v, fig. 2; Rich., Zool. Ereb. & Terr., 1848, p. 118, pl. liii.

Grystes brisbanii Less., Voy. Coquille, Zool. ii, 1831, p. 227.

Gristes peelii Mitch., Exp. Aust., i, 1838, p. 95, pl. v, fig. 1.

Oligorus macquariensis Günth., Cat. Fish. Brit. Mus., i, 1859, p. 251; McCoy, Prod. Zool. Viet., dec. ix, 1884, pl. lxxxv, lxxxvi; Ogil., Edib. Fish. N.S.W., 1893, p. 17, pl. viii; Stead, Edib. Fish. N.S.W., 1908, p. 56, pl. xxiv; Roughley, Fish. Aust., 1916, p. 62, pl. xvi.

Oligorus mitchellii Cast., P.Z.S., Viet., ii, 1873, p. 150.

Homodemus cavifrons De Vis, P.L.S., N.S.W., ix, 1884, p. 396.

Oligorus gibbiceps Macl., P.L.S., N.S.W., x, 1885, p. 267.

Fig. 135. *Oligorus macquariensis.*

The largest and most esteemed fresh-water fish: is smoked and cured in various ways. Attains to a length of nearly 5 feet and a weight of 100 lb.

COLPOGNATHUS Klunzinger, 1880 (dentex).

COLPOGNATHUS DENTEX Cuvier & Valenciennes (Harlequin Fish).

Plectropoma dentex Cuv. & Val., Hist. Nat. Poiss., ii, 1828, p. 394; Quoy & Gaim., Voy. Astrol., 1835, p. 660, pl. iv, fig. 2; Rich., Zool. Ereb. & Terr., 1848, p. 117, pl. lvii, fig. 3-5.

Plectropoma richardsonii Günth., P.Z.S., 1861, p. 391, pl. xxxviii.

Colpognathus dentex Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 339, pl. i, fig. 1 (head); Boul., Cat. Fish. Brit. Mus. (2), i, 1895, p. 310, fig. 21 (dentition).

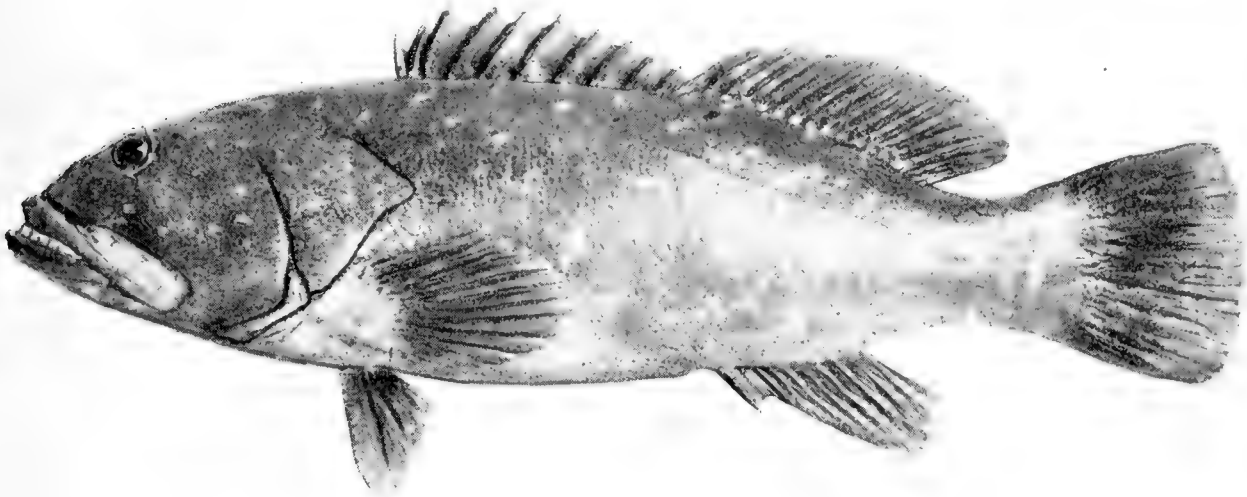


Fig. 136. *Colpognathus dentex.*

A good eating fish, but seldom seen in the markets. Of gorgeous colouration; scarlet, with blue spots and yellow markings.

CALLANTHIAS Lowe, 1839 (paradisaeus).

CALLANTHIAS ALLPORTI Günther (Allport's Perch).

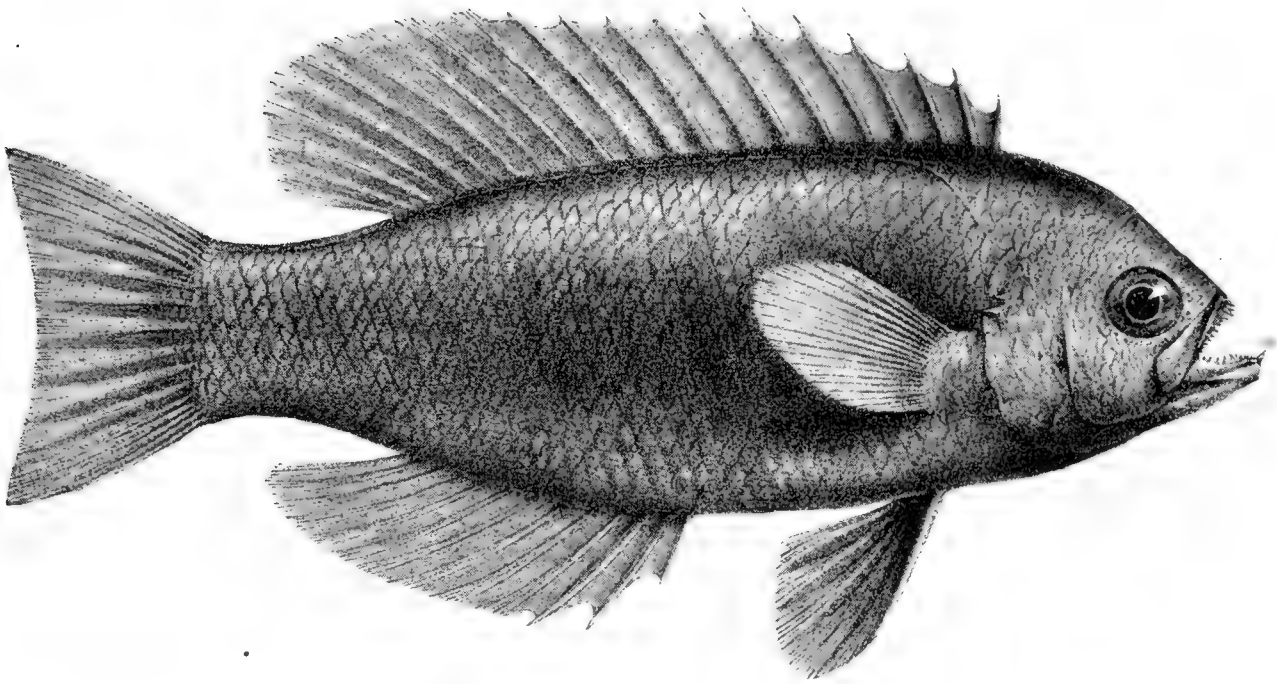


Fig. 137. *Callanthias allporti.*

Callanthias allporti Günth., A.M.N.H. (4), xvii, 1876, p. 390; Boul., Cat. Fish. Brit. Mus. (2), i, 1895, p. 335, pl. xv; Waite, Prelim. Rep. Thetis Exped., 1898, p. 31, pl. ii; McCull., Endeavour Rep., i, 1911, p. 51.

Callanthias platei Boul., A.M.N.H. (7), iii, 1899, p. 346; Waite, Mem. Aust. Mus., iv, 1899, p. 80.

Callanthias platei australis and *Anogramma allporti* Ogil., P.L.S., N.S.W., xxiv, 1899, p. 173, 175.

Not very common in Australian waters, but said to occur in large shoals off the west coast of America.

CAESIOPERCA Castelnau, 1872 (rasor).

CAESIOPERCA RASOR Richardson (Red Perch).

Serranus rasor Rich., P.Z.S., 1839, p. 95 and T.Z.S., iii, 1849, p. 73, pl. iv, fig. 1.
Anthias rasor Günth., Cat. Fish. Brit. Mus., i, 1859, p. 93.
Caesioperca rasor Cast., P.Z.S., Vict., i, 1872, p. 49.
Anthias extensus Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 339, pl. ii.

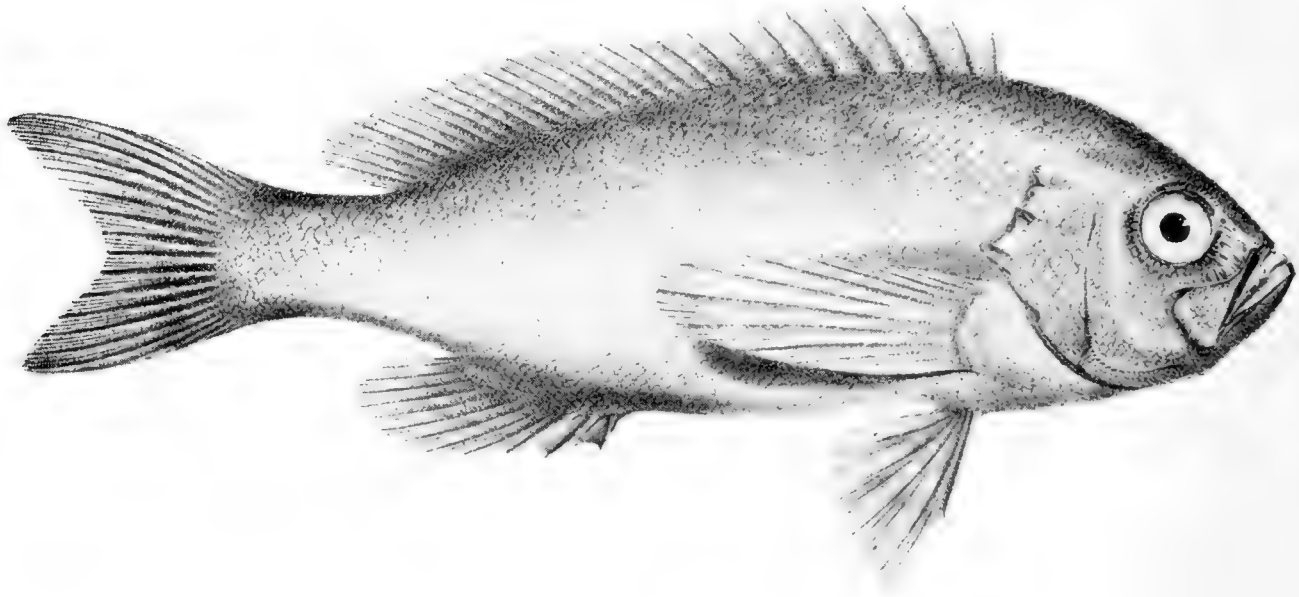


Fig. 138. *Caesioperca rasor.*

Common in winter in Tasmania, where it is known as The Barber.

CAESIOPERCA LEPIDOPTERA Forster (Butterfly Perch).

Epinephelus lepidopterus Forst., in Bl. & Schn., Syst. Ichth., 1801, p. 302.
Serranus lepidopterus Rich., A.M.N.H., ix, 1842, p. 18.
Perca lepidoptera Forst., Descr. Anim., 1844, p. 138.
Anthias richardsonii Günth., P.Z.S., 1869, p. 429.

Scorpis hectori Hutt., Cat. Fish. N.Z., 1872, p. 4, pl. i, fig. 4.
Pseudanthias lepidopterus Gill., Mem. Acad. Wash., vi, 1894, p. 116.
Caesioperca lepidoptera. Boul., Cat. Fish. Brit. Mus. (2), i, 1895, p. 312; Roughley, Fish. Aust., 1916, p. 75, pl. xxi.
Anthias lepidopterus Waite, Prelim. Rep. Thetis Exped., 1898, p. 31, pl. i.

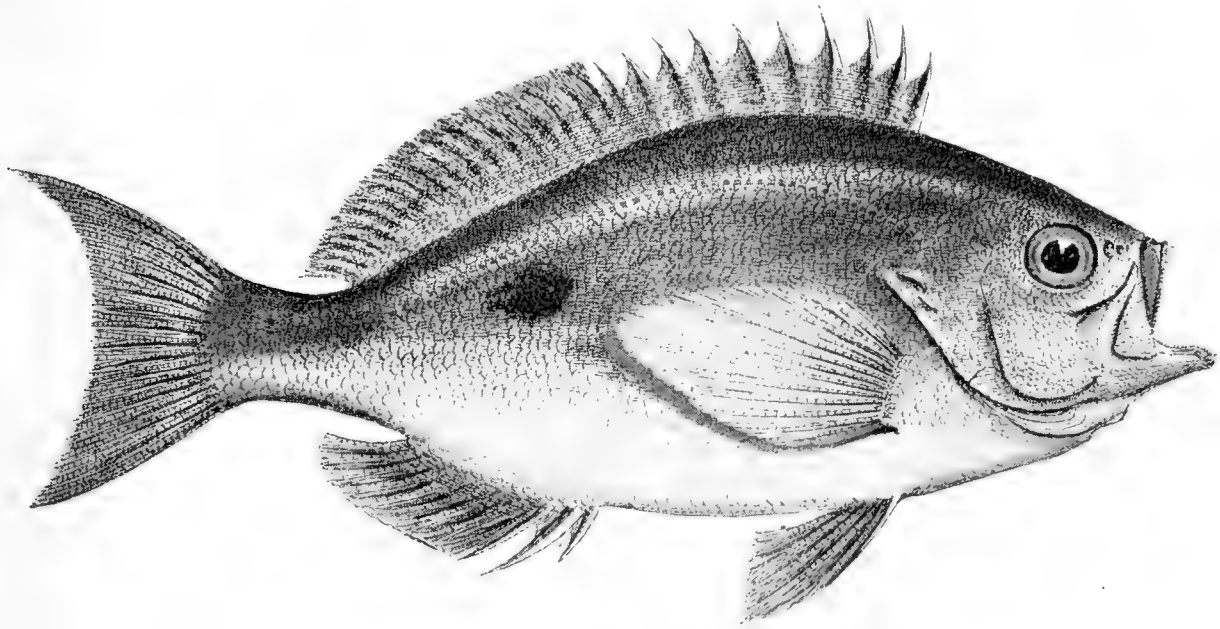


Fig. 139. *Caesioperca lepidoptera.*

Commonly taken at moderate depths off New South Wales and Tasmania, where it is much esteemed. It was almost unknown until the advent of the trawl.

HYPOPLECTRODES Gill, 1862 (nigroruber).

HYPOPLECTRODES NIGRORUBER Cuvier & Valenciennes (Black-banded Sea Perch).

Plectropoma nigrorubrum Cuv. & Val., Hist. Nat. Poiss., ii, 1828, p. 402; Quoy & Gaim., Voy. Astrol., iii, 1835, p. 659, pl. iv, fig. 1; Ogil., Edib. Fish. N.S.W., 1893, p. 11.
Hypoplectrodes nigroruber Gill (Poey), Ann. Lyc. Nat. Hist. N. York, x, 1871, p. 45.
Gilbertia nigrorubra Boul., Cat. Fish. Brit. Mus. (2), i, 1895, p. 308.

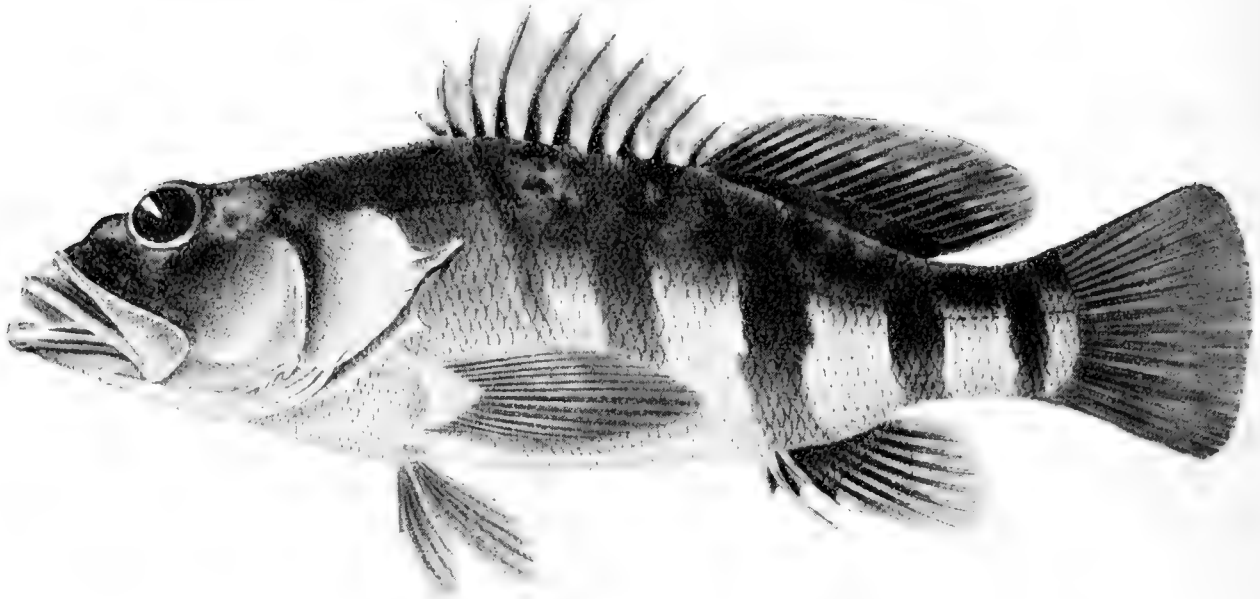


Fig. 140. *Hypoplectrodes nigroruber.*

Occurs from Eastern to Western Australia, and though much appreciated is not common.

FAMILY CENTRARCHIDAE.

NANNOPERCA Günther, 1861 (australis).

NANNOPERCA AUSTRALIS Günther (Pigmy Perch).

Nannoperca australis Günth., P.Z.S., 1861, p. 116, pl. xix, fig. 2; McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 46, pl. ii, fig. 1.

Paradules lectus Klunz., Arch. f. Naturg., xxxviii, 1872, p. 21.

?Microperca yarrae Cast., P.Z.S., Viet., i, 1872, p. 48.

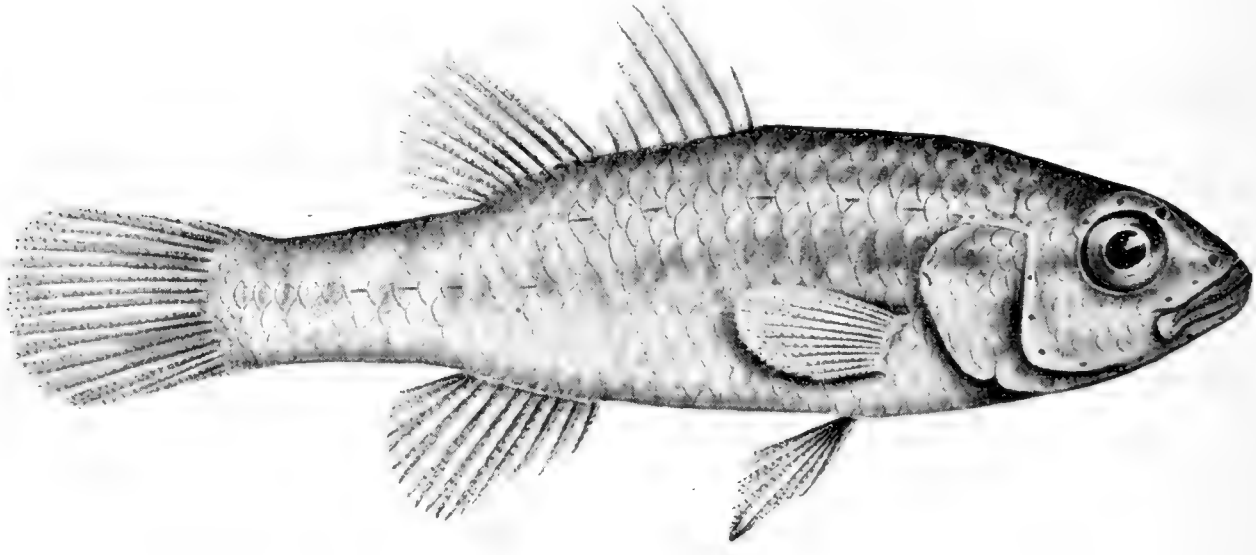


Fig. 141. *Nannoperca australis.*

?Nannoperca riverinae Macl., P.L.S., N.S.W., v, 1881, p. 342.
?Microperca tasmaniae Johnston, P.R.S., Tasm., 1883, p. 110.
Micropena Zietz, T.R.S., S.A., xxvi, 1902, p. 265.

An excellent fresh-water aquarium fish.

FAMILY THERAPONIDAE.

THERAPON Cuvier, 1817 (servus); (originally spelt Terapon).

THERAPON PERCOIDES Günther (Black-striped Perch).

Therapon percoides Günth., A.M.N.H. (3), xiv, 1864, p. 374; Zietz, Rep. Horn. Exped., ii, 1896, p. 177, pl. xvi, fig. 1; Ogil. & McCull., Mem. Qld. Mus., v, 1916, p. 105, pl. x, fig. 1.
Datnia fasciata Steind., Sitzb. Akad. Wiss. Wien, lvi, 1867, p. 322.
Therapon fasciatus Cast., Res. Fish. Aust., 1875, p. 11.
Therapon terrae-reginae Cast., P.L.S., N.S.W., ii, 1878, p. 227.
Therapon spinosior De Vis, P.L.S., N.S.W., ix, 1884, p. 397.

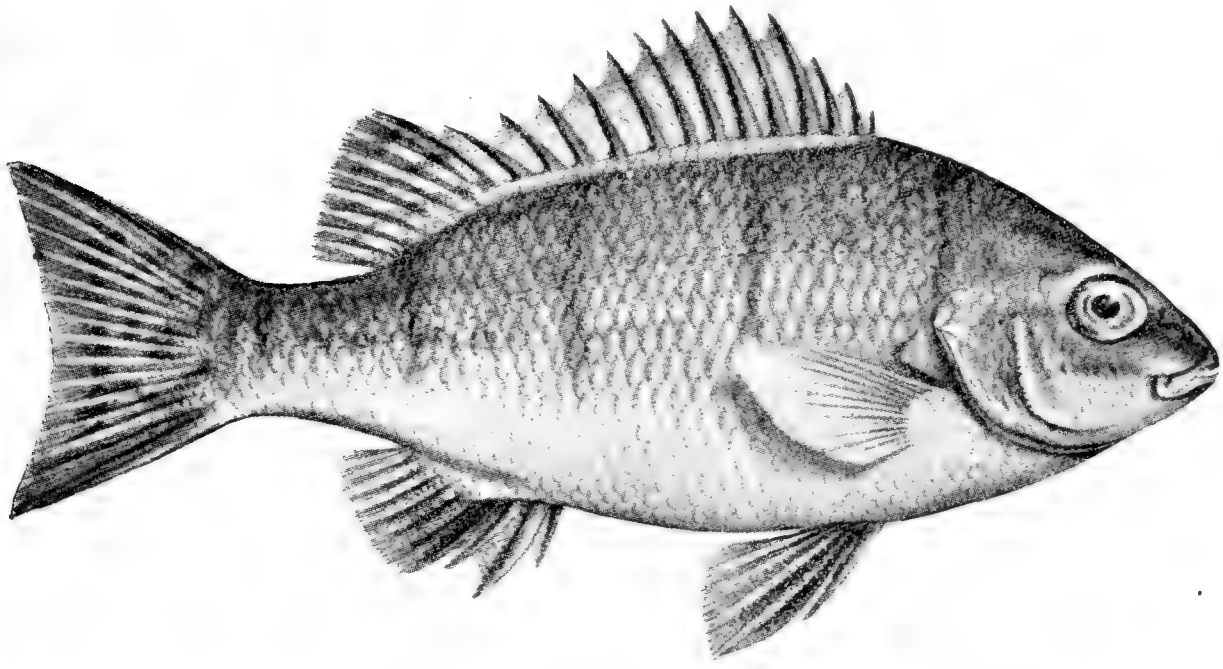


Fig. 142. *Therapon percoides.*

In Australia, the members of the genus *Therapon* are confined to fresh-water.

THERAPON BIDYANA Mitchell (Silver Perch, Teheri).

Acerina (Cernua) bidyana Mitch., Exped. Aust., i, 1838, p. 95, pl. viii.
Datnia elliptica Rich., Zool. Ereb. & Terr., 1848, p. 118, pl. lii, fig. 4-8.

Therapon ellipticus Günth., Cat. Fish. Brit. Mus., i, 1859, p. 276; Ogil., Edib. Fish. N.S.W., 1893, p. 28, pl. vi; Stead, Fish. Aust., 1906, p. 123, pl. iv and Edib. Fish. N.S.W., 1908, p. 73, pl. xlii.

Therapon niger and *T. richardsoni* Cast., P.Z.S., Vict., i, 1872, p. 59, 60.

Therapon macleayana Rams., P.L.S., N.S.W., vi, 1882, p. 831.

Therapon bidyana McCull., Rec. Aust. Mus., ix, 1913, p. 359 and P.L.S., N.S.W., xl, 1915, p. 262, pl. xxxvi, fig. 1; Ogil. & McCull., Mem. Qld. Mus., v, 1916, p. 112.

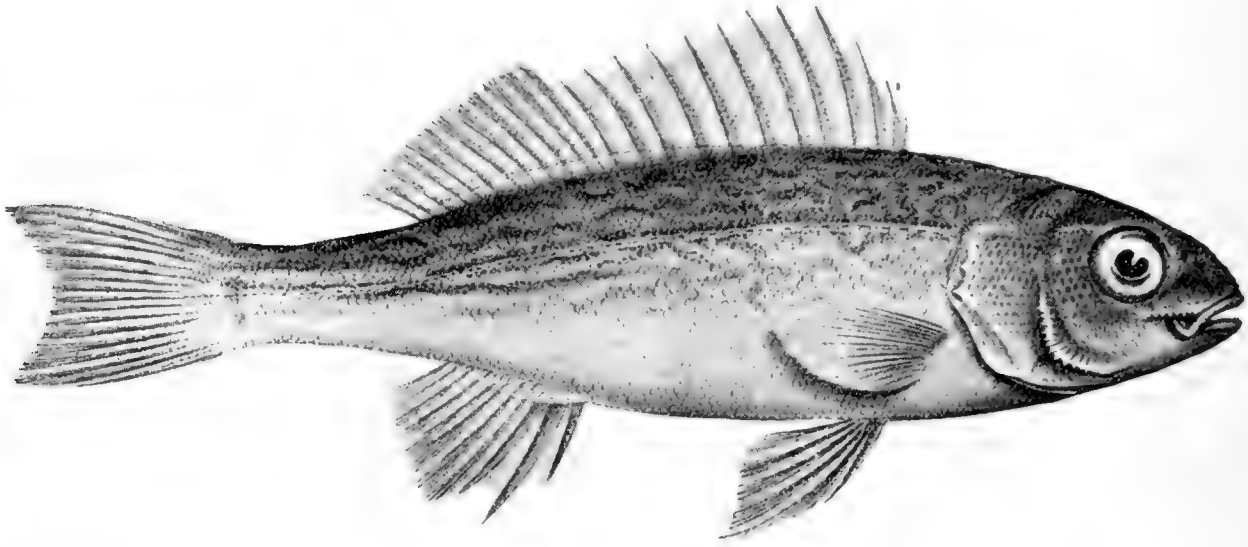


Fig. 143. *Therapon bidyana.*

A good sporting and food fish, common in the River Murray system.

THERAPON UNICOLOR Günther.

Therapon unicolor Günth., Cat. Fish. Brit. Mus., i, 1859, p. 277; Ogil. & McCull., Mem. Qld. Mus., v, 1916, p. 109, pl. xi, fig. 1.

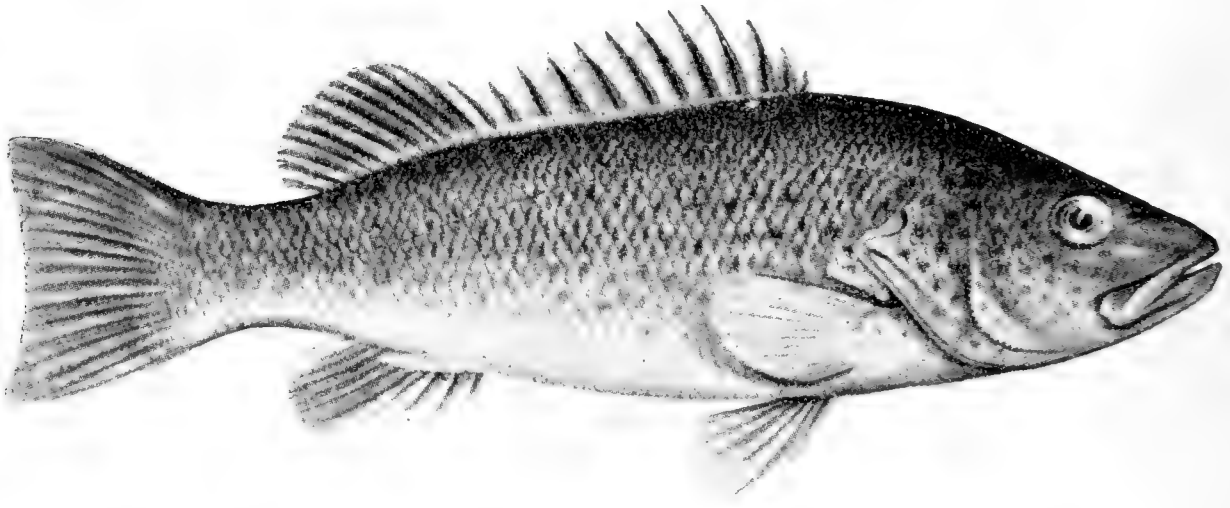


Fig. 144. *Therapon unicolor.*

?Datnia brevispinis Steind., Sitzb. Akad. Wiss. Wien, lvi, 1867, p. 309.
Therapon truttaceus and *T. longulus* Macl., P.L.S., N.S.W., v, 1881, p. 366, 367.
Therapon elphinstonensis De Vis, P.R.S., Qld., i, 1885, p. 57.
Terapon idoneus Ogil., P.R.S., Qld., xx, 1907, p. 37.

In common with *T. percoides* this species ranges into Central Australia, where it lies dormant in the mud during periods of drought.

THERAPON WELCHI McCulloch & Waite.

Therapon welchi McCull. & Waite, T.R.S., S.A., xli, 1917, p. 472, fig. 1.

This and the following species are, so far, known only from Cooper Creek, in Central Australia.

THERAPON BARCOO McCulloch & Waite.

Therapon barcoo McCull. & Waite, T.R.S., S.A., xli, 1917, p. 474, fig. 2.

HELOTES Cuvier, 1829 (sexlineatus).

HELOTES SEXLINEATUS Quoy & Gaimard (Striped Perch).

Terapon sexlineatus Quoy & Gaim., Voy. Uranie & Physic., 1824, p. 340, pl. lx, fig. 1.
Helotes sexlineatus Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 149, pl. lvi; Valenc. in Cuv., Règ. Anim. Ill. Poiss., 1839, pl. xii, fig. 3; Bleek., Atl. Ichth., vii, 1876, p. 118, pl. cccxlii, fig. 5; Kner, Reise Novara, Fisch., 1865, p. 46, pl. iii, fig. 1.

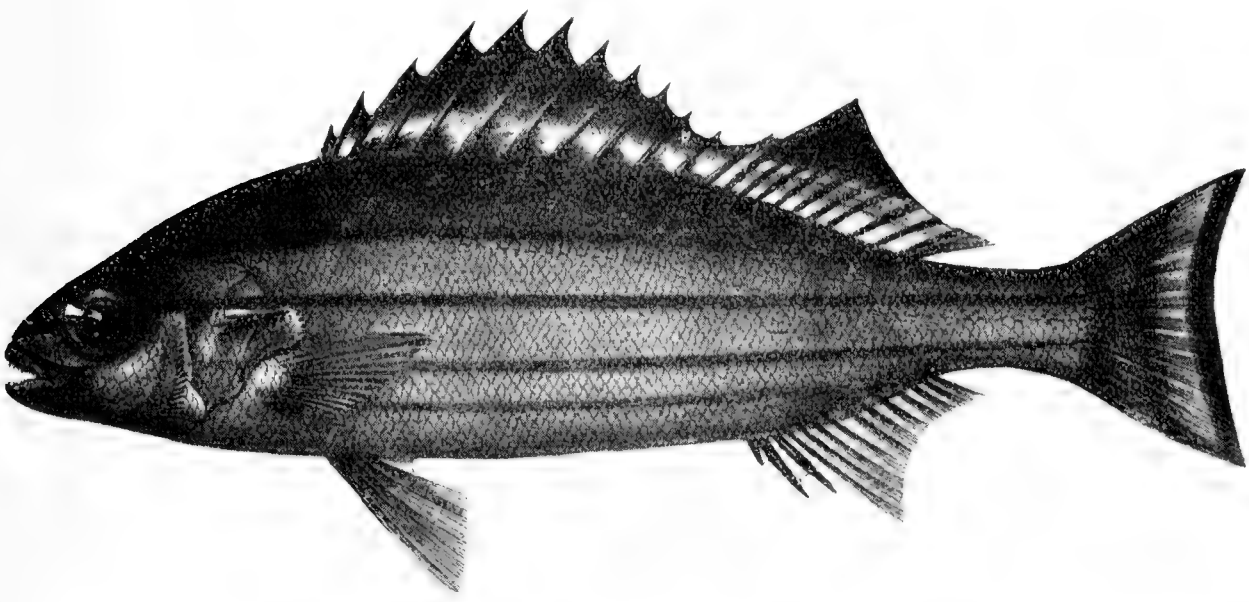


Fig. 147. *Helotes sexlineatus.*

?Helotes profundior De Vis, P.L.S., N.S.W., ix, 1884, p. 397.
?Helotes scotus Haacke, Zool. Anz., viii, 1885, p. 508.

Our only marine species of the Family.

FAMILY PLESIOPIDAE.

PARAPLESIOPS Bleeker, 1875 (bleekeri).

PARAPLESIOPS MELEAGRIS Peters (Blue Devil).

Plesiops meleagris Peters, Mon. Akad. Wiss. Berlin, 1870, p. 708.
Ruppellia prolongata Cast., Res. Fish. Aust., 1875, p. 29 (not of 1873).
Paraplesiops meleagris Boul., Cat. Fish. Brit. Mus. (2) i, 1895, p. 339; McCull., Rec. W.A. Mus., i, 1912, p. 84, pl. ix.

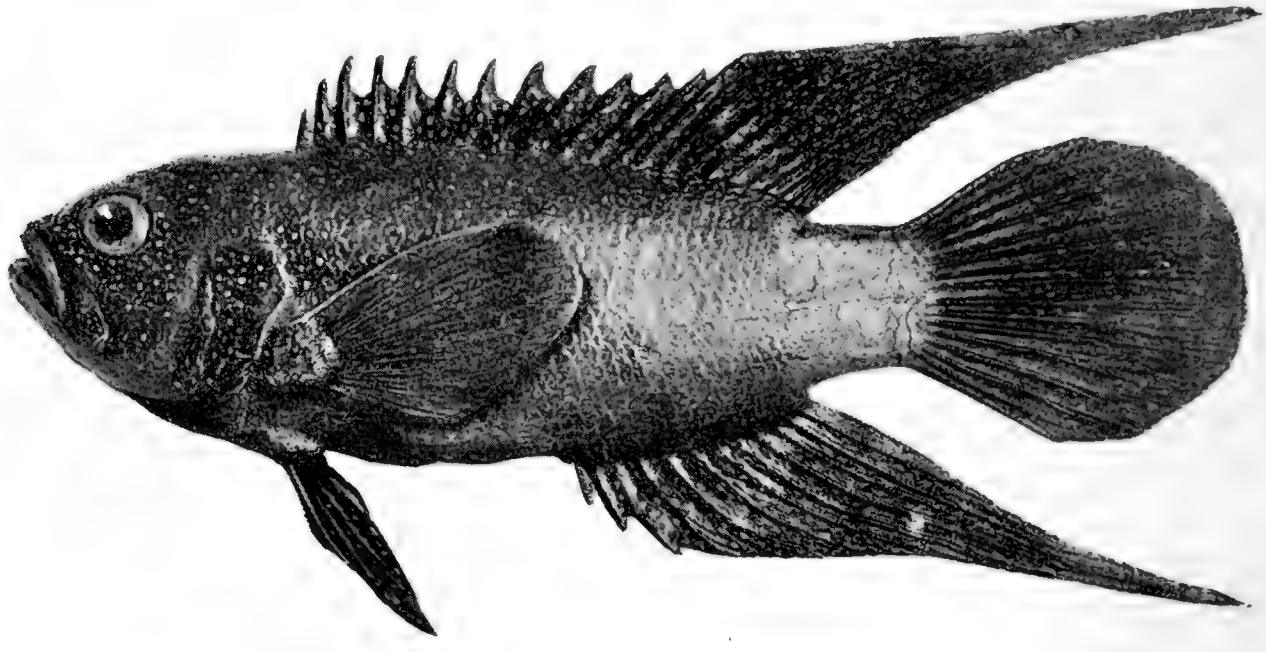


Fig. 148. *Paraplesiops meleagris.*

Of intense blue colour with pale blue spots.

PARAPLESIOPS GIGAS Steindachner.

Plesiops gigas Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 196 and Sitzb., Akad. Wiss. Wien, lxxxviii, 1884, p. 1089.
Paraplesiops gigas Boul., Cat. Fish. Brit. Mus., i, 1895, p. 339.

FAMILY APOGONIDAE.

APOGON Lacepède, 1802 (ruber).

APOGON CONSPERSUS Klunzinger (Soldier Fish).

Apogon conspersus Klunz., Arch. f. Naturg., xxxviii, 1872, p. 18 and Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 344, pl. iii, fig. 2; Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1066, pl. i, fig. 1.

Vincentia waterhousii Cast., P.Z.S., Vict., i, 1872, p. 245.

Apogon opercularis Macl., P.L.S., N.S.W., ii, 1878, p. 347, pl. vii, fig. 1.

Amia conspersa McCull., Endeavour Res., ii, 1914, p. 103.

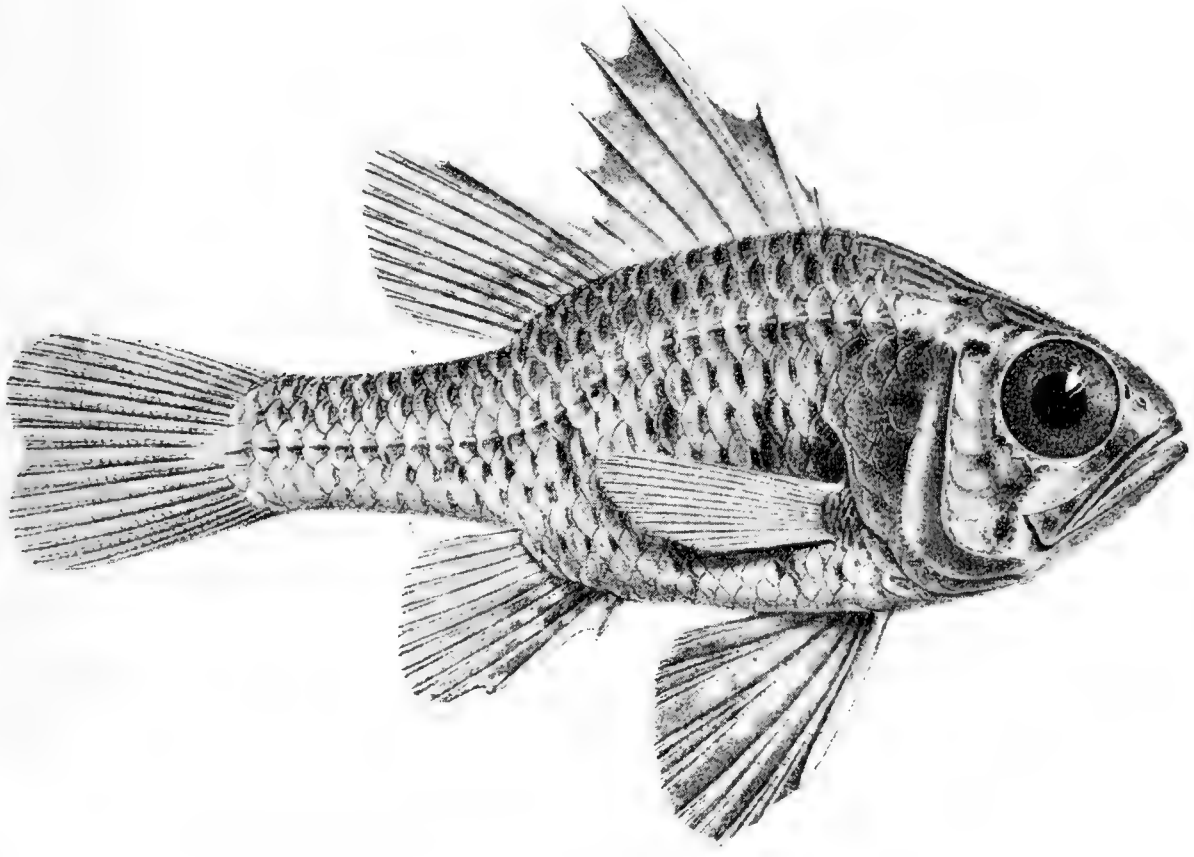


Fig. 150. *Apogon conspersus.*

DINOLESTES Klunzinger, 1872 (mulleri=lewini).

DINOLESTES LEWINI Griffith (Long-finned Pike).

Esox lewini Griffith, Ann. King., x, 1834, p. 465, pl. lx.

Dinolestes muelleri Klunz., Arch. f. Naturg., 1872, p. 30, pl. iii; Ogil., Edib. Fish. N.S.W., 1893, p. 115.

Neosphyraena multiradiata Cast., P.Z.S., Vict., i, 1872, p. 97.

Lanioperca mordax Günth., A.M.N.H. (4), x, 1872, p. 183; McCoy, Prod. Zool. Vict., dec. xii, 1886, pl. cxv.

Dinolestes lewini Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 30.

Fig. 151. *Dinolestes lewini.*

This fish has no near relationship to the Snook, which is also known as the Short-finned Pike.

FAMILY SILLAGINIDAE.

SILLAGINODES Gill, 1861 (punctatus).

SILLAGINODES PUNCTATUS Cuvier & Valenciennes (Spotted Whiting).

Sillago punctata Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 413; Quoy & Gaim., Voy. Astrol., iii, 1835, p. 671, pl. i, fig. 1; Stead, Edib. Fish. N.S.W., 1908, p. 66, pl. xxxvi.

Sillaginodes punctatus Gill, Proc. Acad. Nat. Sci. Phil., 1861, p. 505.

Isosillago maculata Macl., P.L.S., N.S.W., iii, 1878, p. 34, pl. iv, fig. 3 (not Quoy & Gaim.).

Fig. 152. *Sillaginodes punctatus.*

The largest and most esteemed of the Australian Whitings; attains a length of 20 inches.

SILLAGO Cuvier, 1817 (acuta).

SILLAGO BASSENSIS Cuvier & Valenciennes (Bass Whiting).

Sillago bassensis Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 412; Quoy & Gaim., Voy. Astrol., iii, 1835, p. 672, pl. i, fig. 2; Stead, Edib. Fish. N.S.W., 1908, p. 65, pl. xxxv.

Sillago maculata Cast., P.Z.S., Vict., i, 1872, p. 94 (not Quoy & Gaim.).

Sillago ciliata Johnston, P.R.S., Tasm., 1883, p. 80, 116 (not Cuv. & Val.).

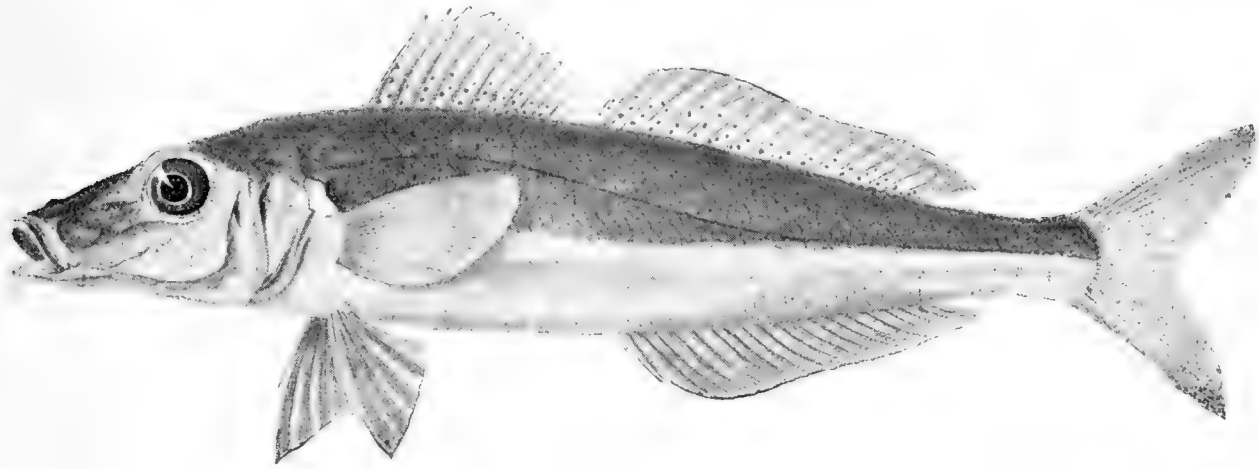


Fig. 153. *Sillago bassensis.*

The Australian Whitings are in no wise related to their European namesakes.

FAMILY CARANGIDAE.

SCOMBEROIDES Lacepède, 1802 (commersonianus).

SCOMBEROIDES TOLOO Cuvier & Valenciennes (Leather-skin).

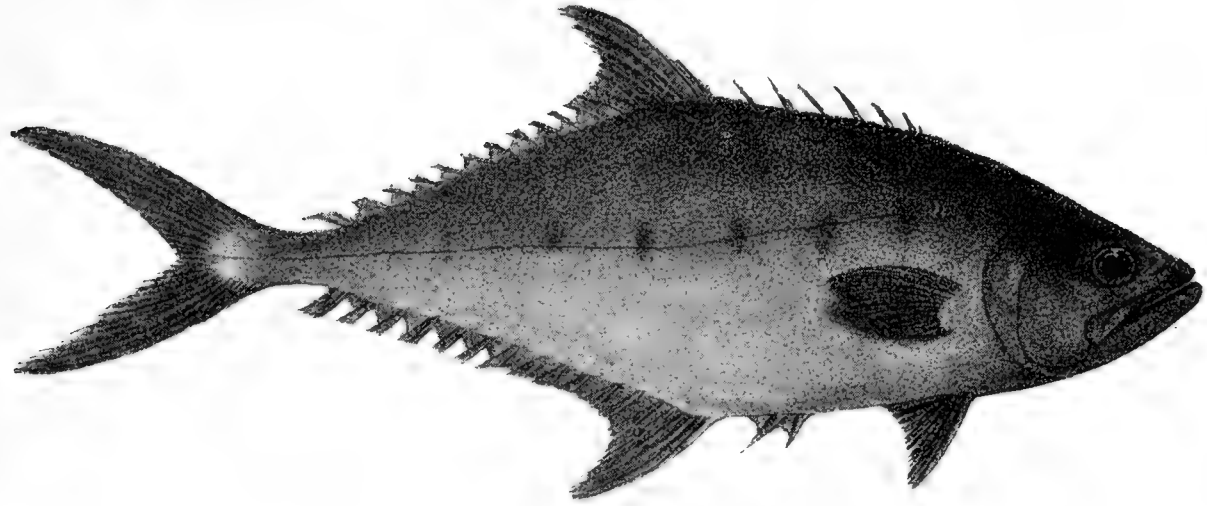


Fig. 154. *Scomberoides toloo.*

Chorinemus toloo Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 377; Day, Fish. India, 1878, p. 232, pl. li A. fig. 3; Cast., Res. Fish. Aust., 1875, p. 19 (not *Lichia toloo-parah* Rüpp.).

SERIOLA Cuvier, 1817 (dumerilli).

SERIOLA GRANDIS Castelnau (Yellow-tail).

Seriola grandis Cast., P.Z.S., Viet., i, 1872, p. 115; McCull., Endeavour Res., iii, 1915, p. 121, pl. xxxv, fig. 1; Roughley, Fish. Aust., 1916, p. 97, pl. xxx.

Seriola lalandii Cast., P.L.S., N.S.W., iii, 1879, p. 352; McCoy, Prod. Zool. Viet., dec. xviii, 1889, pl. clxxii; Ogil., Edib. Fish. N.S.W., 1893, p. 82 (not Cuv. & Val.).

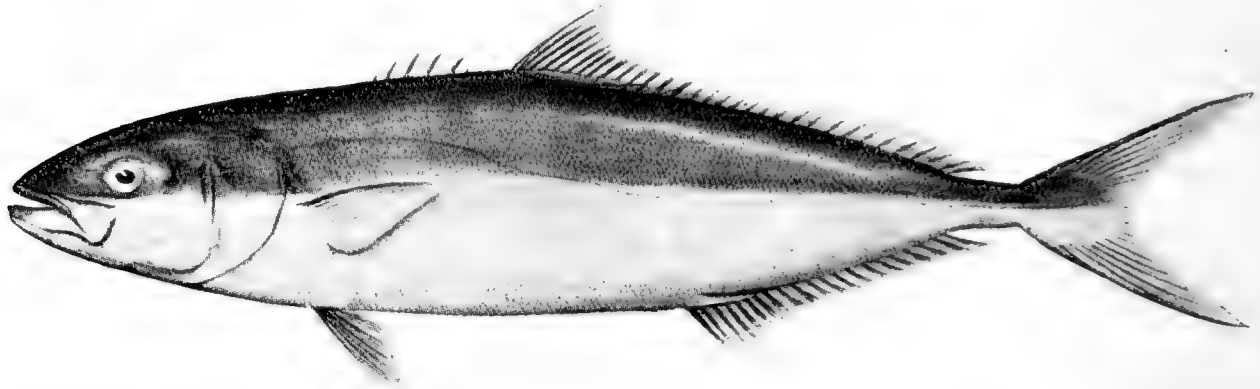


Fig. 155. *Seriola grandis.*

A good edible and sporting fish, attaining a weight of 60 lb.

TRACHURUS Rafinesque, 1810 (trachurus).

TRACHURUS NOVAE-ZELANDIAE Richardson (Horse Mackerel).

Trachurus novae-zelandiae Rich., Rep. Brit. Ass., 1843, p. 21; McCull., Endeavour Res., iii, 1915, p. 123, pl. xxxiv, fig. 3.

Trachurus trachurus Hutt., Cat. Fish. N.Z., 1872, p. 16, pl. iii, fig. 23; McCoy, Prod. Zool. Viet., dec. ii, 1878, pl. xviii; Ogil., Edib. Fish. N.S.W., 1893, p. 77 (not Linn.).

Trachurus declivis Waite, Mem. Aust. Mus., iv, 1899, p. 72 (not Jenyns).

Decapterus leptosomus Stead, Edib. Fish. N.S.W., 1908, p. 87 (not Ogil.).

Very similar to the next species, the differences scarcely to be shown in an illustration.

TRACHURUS DECLIVIS Jenyns (Scad).

Caranx declivis Jenyns, Voy. Beagle, iii, 1842, p. 68, pl. xiv.

Trachurus declivis McCull., Endeavour Res., iii, 1915, p. 125, pl. xxxiv, fig. 2; Roughley, Fish. Aust., 1916, p. 101.

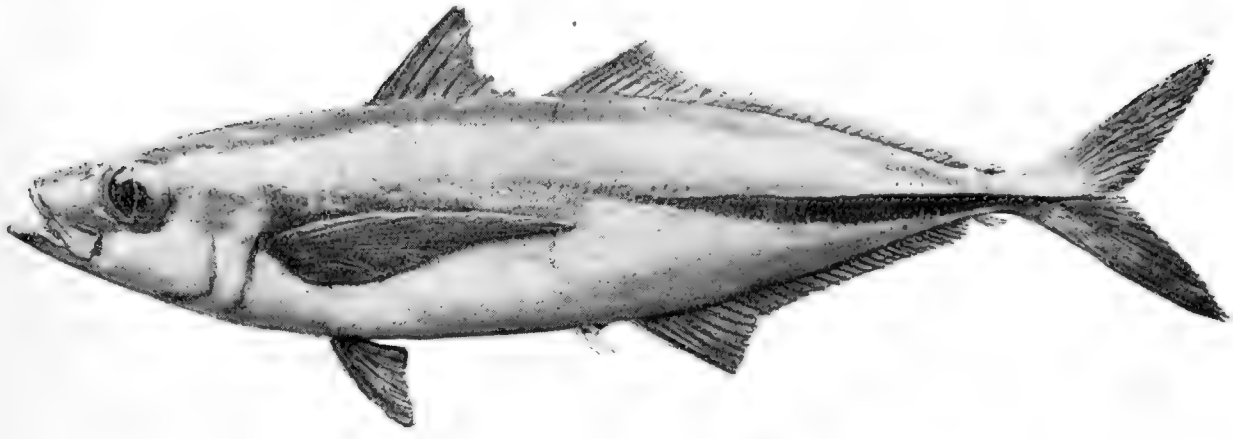


Fig. 157. *Trachurus declivis.*

CARANX Lacepède, 1802 (carangus).

CARANX GEORGIANUS Cuvier & Valenciennes (Trevally).

Caranx georgianus Cuv. & Val., Hist. Nat. Poiss., ix, 1833, p. 85; Rich., Zool. Ereb. & Terr., 1848, p. 135, pl. lviii, fig. 1-3; Ogil., Edib. Fish. N.S.W., 1893, p. 80, pl. xxiv; Stead, Edib. Fish. N.S.W., 1908, p. 87, pl. lvii; McCull., Endeavour Res., iii, 1915, p. 126, pl. xx; Roughley, Fish. Aust., 1916, p. 95, pl. xxix.

Caranx nobilis Macl., P.L.S., N.S.W., v, 1881, p. 532.

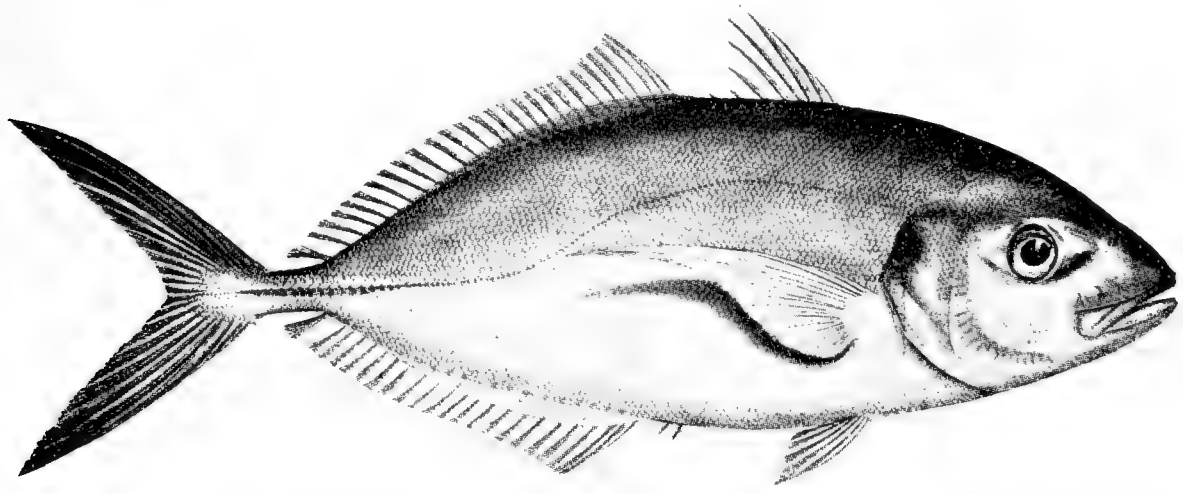


Fig. 158. *Caranx georgianus.*

Grows to 30 inches in length; it is an excellent food fish and is used fresh, salted, or smoked.

FAMILY POMATOMIDAE.

POMATOMUS Lacepède, 1802 (skib=saltator).

POMATOMUS SALTATOR Linnaeus (Skipjack).

Perca saltatrix Linn., Syst. Nat. (ed. x), 1758, p. 293.

Temnodon saltator Cuv. & Val., Hist. Nat. Poiss., ix, 1833, p. 225, pl. cclx; Valenc. in Cuv., Règ. Anim. Ill. Poiss., 1839, pl. lvi, fig. 3; McCoy, Prod. Zool. Viet., dec. xix, 1889, pl. clxxxiii; Ogil., Edib. Fish. N.S.W., 1893, p. 86, pl. xxv (ref.).

Pomatomus saltatrix Jord. & Gilb., Bull. U.S. Nat. Mus., xvi, 1883, p. 914; Stead, Edib. Fish. N.S.W., 1908, p. 90, pl. lxi; Roughley, Fish. Aust., 1916, p. 108, pl. xxxiv.

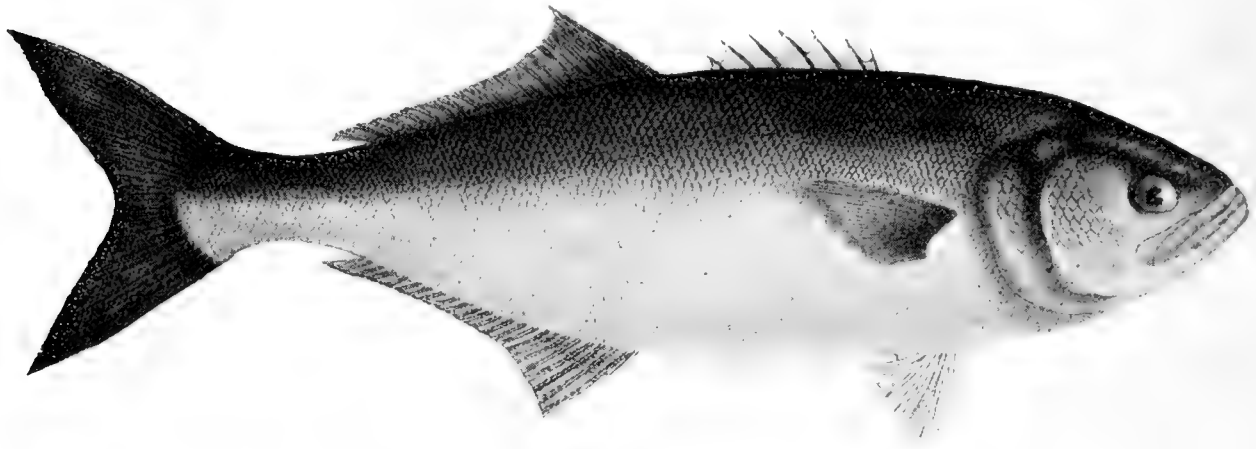


Fig. 159. *Pomatomus saltator.*

Owing to the circumstance that it cuts the fishermen's nets is also known as "Tailor." It is commonly taken in the seine net, but also affords sport to the angler. Is good food, but must be eaten quite fresh.

FAMILY ARRIPIDIDAE.

ARRIPIS Jenyns, 1842 (georgianus).

ARRIPIS TRUTTA Forster (Australian Salmon).

Sciaena trutta Forst., in Bl. & Schn., Syst. Ichth., 1801, p. 542.

?Perca trutta and *P. marginata* Cuv. & Val., Hist. Nat. Poiss., ii, 1828, p. 53, 54.

Centropristes truttaceus Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 50.

Centropristes salar Rich., P.Z.S., 1839, p. 95 and T.Z.S., iii, 1849, p. 78 and Zool. Ereb. & Terr., 1845, p. 29, pl. xx, fig. 4-6.

Centropristes tasmanicus Homb. & Jacq., Voy. Pole Sud, iii, 1853, p. 40, pl. iv, fig. 1.

Arripis salar Günth., Cat. Fish. Brit. Mus., i, 1859, p. 253; Ogil., Edib. Fish. N.S.W., 1893, p. 20, pl. ix.

Arripis truttaceus Günth., *op. cit.* p. 254; McCoy, Prod. Zool. Viet., dec. ii, 1878, pl. xvi, xvii.

Arripis trutta Gill, Mem. Nat. Acad. Sci., vi, 1893, p. 116; Roughley, Fish. Aust., 1916, p. 117, pl. xxxvii.

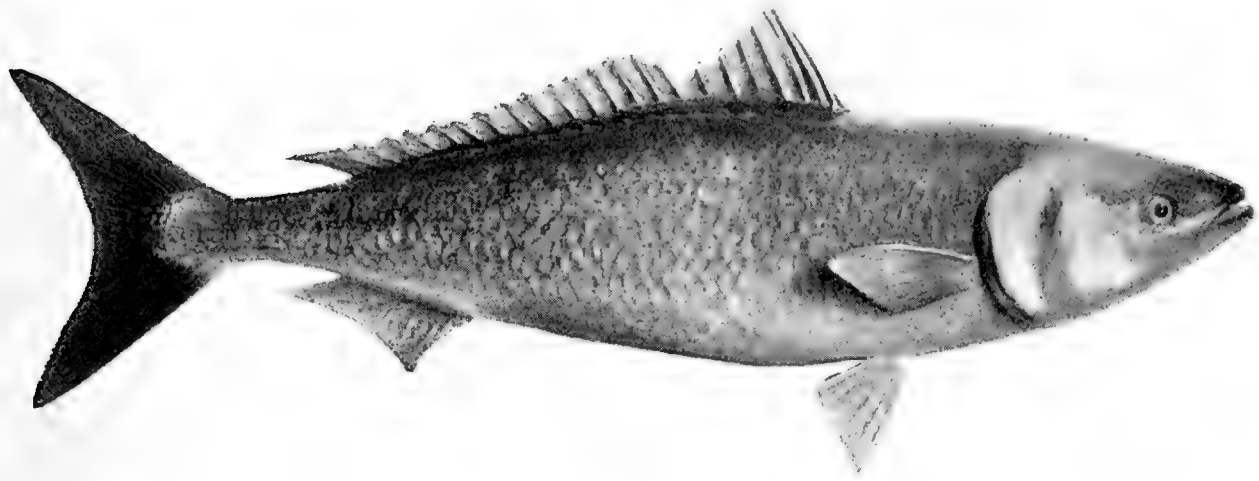


Fig. 160. *Arripis trutta.*

Appears in summer in enormous shoals. Adults are not greatly prized as food, but half-grown examples, known as Salmon Trout, are by no means despised. Gives good sport to anglers.

ARRIPIS GEORGIANUS Cuvier & Valenciennes (Tommy Rough, Wankaldi).

Centropristes georgianus Cuv. & Val., Hist. Nat. Poiss., vii, 1831, p. 451; Rich., Zool. Ereb. & Terr., 1848, p. 117, pl. liv., fig. 3-6.

Arripis georgianus Jenyns, Voy. Beagle, 1842, p. 14; McCoy, Prod. Zool. Vict., dec. xix, 1889, pl. clxxxiv.

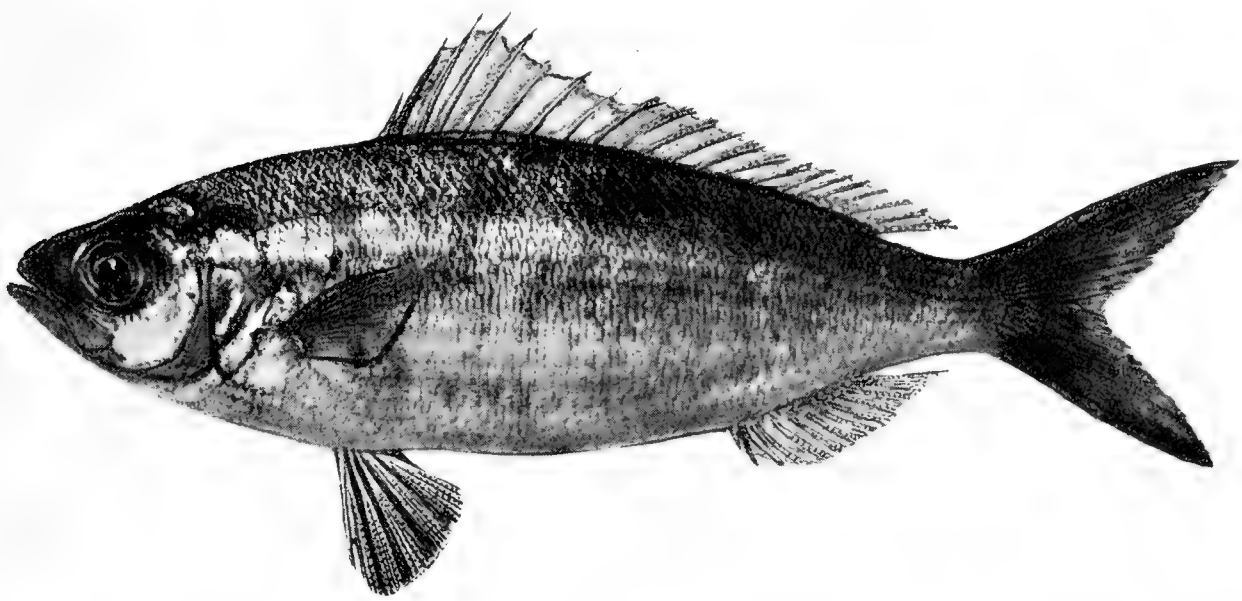


Fig. 161. *Arripis georgianus.*

A small fish, but plentiful and much appreciated as food.

FAMILY ERYTHRICHTHYIDAE.

PLAGIOGENEION Forbes, 1890 (rubiginosus).

PLAGIOGENEION MACROLEPIS McCulloch (Ruby Fish).

Plagiogeneion macrolepis McCull., Endeavour Res., ii, 1914, p. 104, pl. xx.

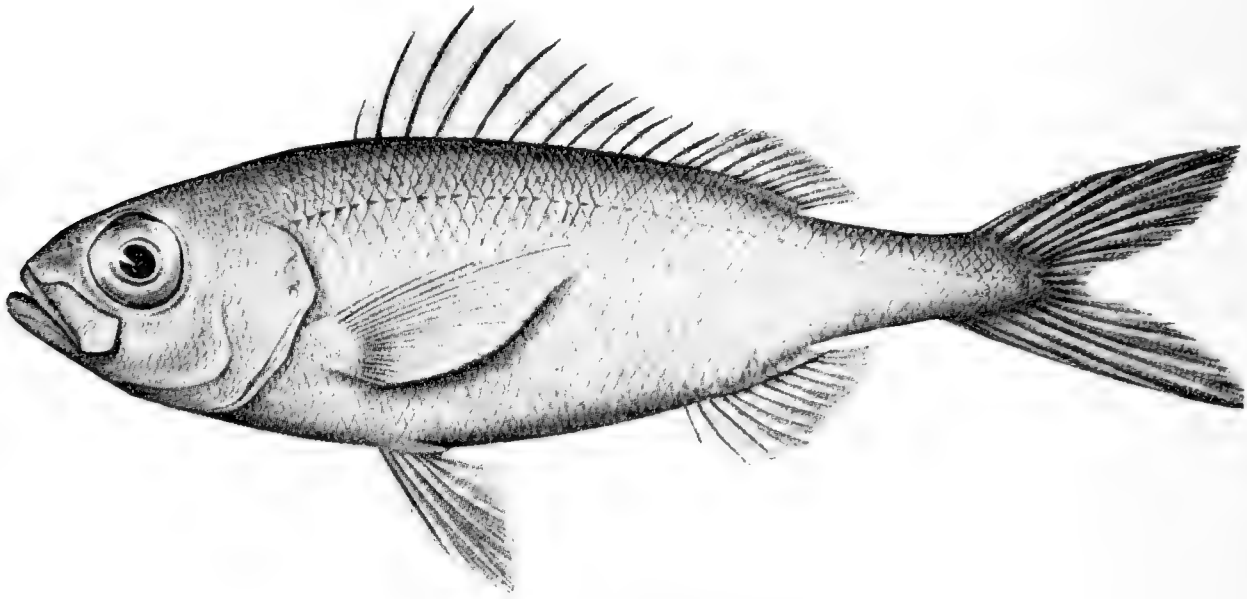


Fig. 162. *Plagiogeneion macrolepis.*

FAMILY GERRIDAE.

PAREQUULA Steindachner, 1879 (bicornis).

PAREQUULA MELBOURNENSIS Castelnau.

Gerres melbournensis Cast., P.Z.S., Vict., i, 1872, p. 158.

Chthamalopteryx melbournensis Ogil., P.Z.S., 1887, p. 616, fig.

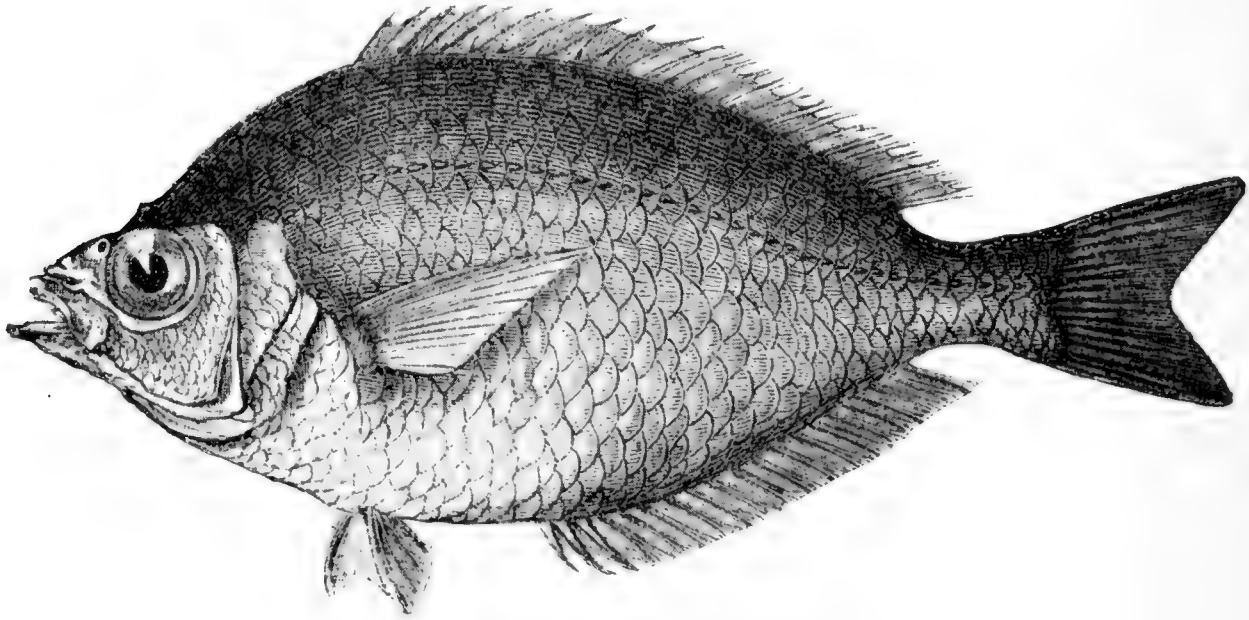


Fig. 163. *Parequula melbournensis.*

FAMILY SCIAENIDAE.

SCIAENA Linnaeus, 1758 (umbra).

SCIAENA ANTARCTICA Castelnau (Butterfish, Mulloway).

Sciaena antarctica Cast., P.Z.S., Vict., i, 1872, p. 100; Ten. Woods, Fish. N.S.W., 1883, p. 53, pl. xvi; Stead, Fish. Aust., 1906, p. 113, fig. 42 and Edib. Fish. N.S.W., 1908, p. 66, pl. xxxvii; Roughley, Fish. Aust., 1916, p. 112, pl. xxxv.
Corvina axillaris De Vis., P.L.S., N.S.W., ix, 1884, p. 538.
Sciaena neglecta Rams. & Ogil., P.L.S., N.S.W. (2), i, 1886, p. 941.
Sciaena aquila Ogil., Edib. Fish. N.S.W., 1893, p. 72, pl. xxii.
Sciaena hololepidota antarctica Ogil., Mem. Qld. Mus., vi, 1918, p. 70, pl. xxi.

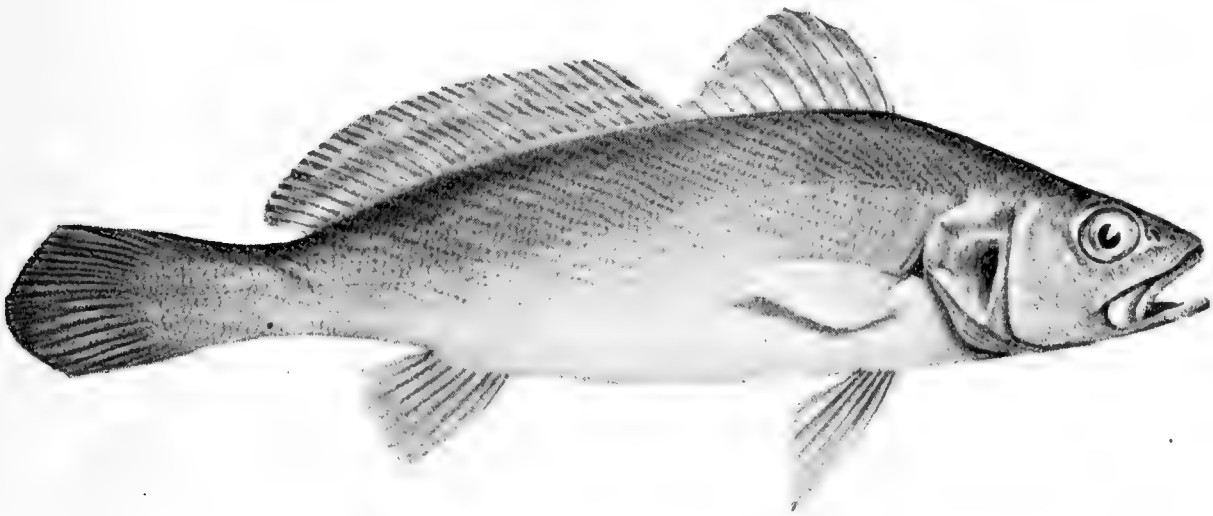


Fig. 164. *Sciaena antarctica.*

One of the most popular food fishes of the State, plentiful, and of good keeping quality.

FAMILY MULLIDAE.

UPENEUS Cuvier, 1829 (bifasciatus).

UPENEUS POROSUS Cuvier & Valenciennes (Red Mullet).

Upeneus porosus Cuv. & Val., Hist. Nat. Poiss., iii, 1829, p. 455.
Upeneichthys porosus Günth., Cat. Fish. Brit. Mus., i, 1859, p. 400; Roughley, Fish. Aust., 1916, p. 139, pl. xliv.
Upeneichthys vlamingii Hect., T.N.Z. Inst., ix, 1877, p. 465, pl. ix, fig. 5.
Hypeneus vlamingii and *H. porosus* Ogil., Cat. Fish. N.S.W., 1886, p. 17.
Mullus porosus Ogil., Edib. Fish. N.S.W., 1893, p. 33.

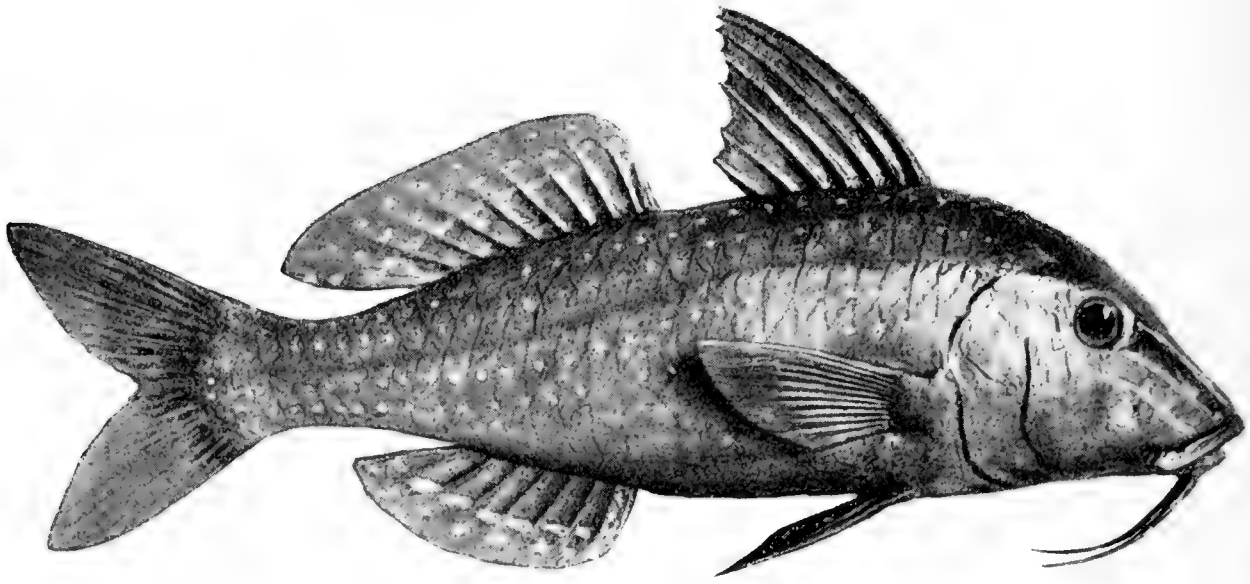


Fig. 165. *Upeneus porosus.*

As much appreciated as was its Mediterranean congenor by the Romans of old.

FAMILY SPARIDAE.

PAGROSOMUS Gill, 1893 (auratus).

PAGROSOMUS AURATUS Foster (Snapper).

Sciaena aurata Forst., in Bl. & Schn., Syst. Ichth., 1801, p. 266.
Chrysophrys unicolor Quoy & Gaim., Voy. Uran. & Physic., 1824, p. 299.

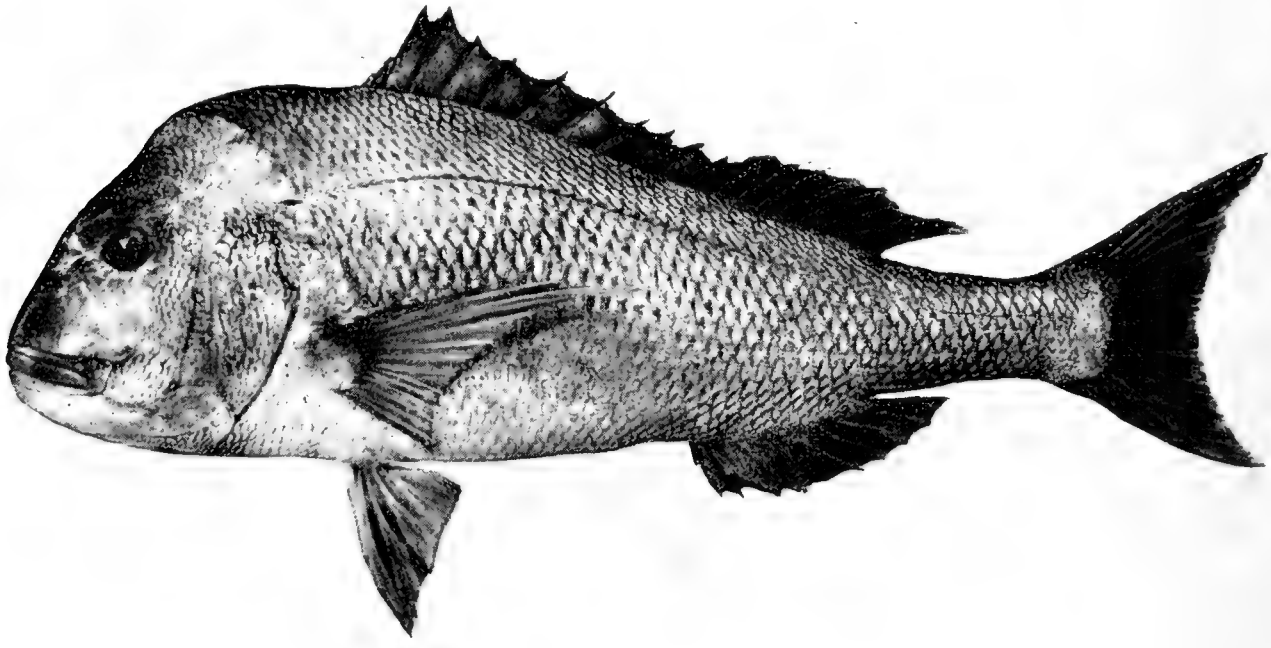


Fig. 166. *Pagrosomus auratus.*

Pagrus unicolor Cuv. & Val., Hist. Nat. Poiss., vi, 1830, p. 162; Ten. Woods, Fish. N.S.W., 1883, p. 39, pl. viii and frontispiece; Ogil., Edib. Fish. N.S.W., 1893, p. 47, pl. xiii.

Pagrus guttulatus and *P. micropterus* Cuv. & Val., Hist. Nat. Poiss., vi, 1830, p. 160, 163.

Pagrus latus Rich., Rep. Brit. Ass., 1842, p. 209.

Chrysophrys gibbiceps Canestrini, Arch. Zool. Anat. (2), i, 1869, p. 154.

Pagrosomus (and *Sparosomus*) *auratus* Gill, Nat. Acad. Sci., vi, 1893, p. 97, 116, 123; Stead, Edib. Fish. N.S.W., 1908, p. 75, pl. xlv; Roughley, Fish. Aust., 1916, p. 130, frontispiece and pl. xlii (young).

The best known Australian food fish, generally caught with hand lines; seldom trawled as in New Zealand.

SPARUS Linnaeus, 1758 (aurata).

SPARUS AUSTRALIS Günther (Black Bream).

Chrysophrys australis Günth., Cat. Fish. Brit. Mus., i, 1859, p. 494; McCoy, Prod. Zool. Viet., dec. i, 1878, pl. iv; Stead, Edib. Fish. N.S.W., 1908, p. 77, pl. xlvi.

Chrysophrys sarba Cast., P.L.S., N.S.W., iii, 1879, p. 373 (not Forsk.).

Pagrus australis Ogil., Edib. Fish. N.S.W., 1893, p. 51, pl. xv.

Sparus australis Roughley, Fish. Aust., 1916, p. 134, pl. xliii.

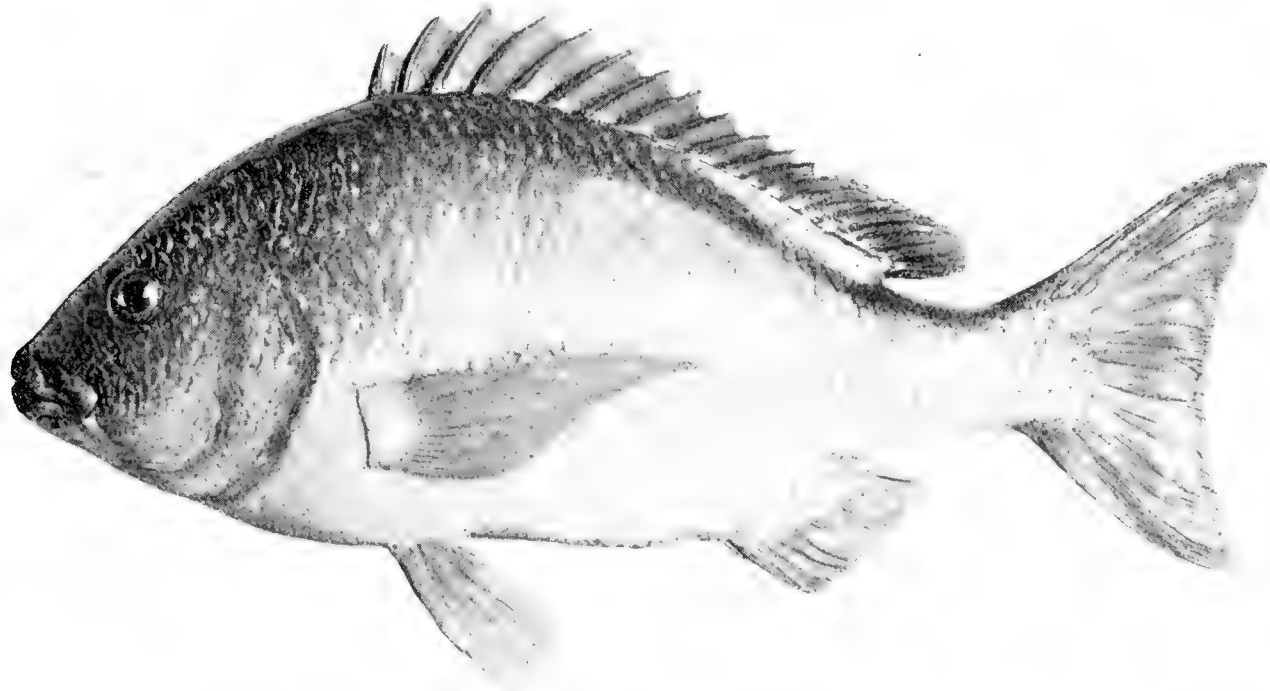


Fig. 167. *Sparus australis.*

A prime favourite with anglers, and said to require a most "delicate finger" for its capture. A delicious table fish.

FAMILY PEMPHERIDAE.

LIOPEMPHERIS Ogilby, 1913 (multiradiata). [? **CATALUFA Snyder,** 1911.]

LIOPEMPHERIS MULTIRADIATA Klunzinger (Bull's-eye).

Pempheris multiradiatus Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 381.
Pempheris macrolepis Macl., P.L.S., N.S.W., v, 1881, p. 516; Waite, Mem. Aust. Mus., iv, 1899, p. 73, pl. x.
Pempheris lineatus Ogil., P.L.S., N.S.W., x, 1885, p. 447.
Liopempheris multiradiata Ogil., Mem. Qld. Mus., ii, 1913, p. 66.

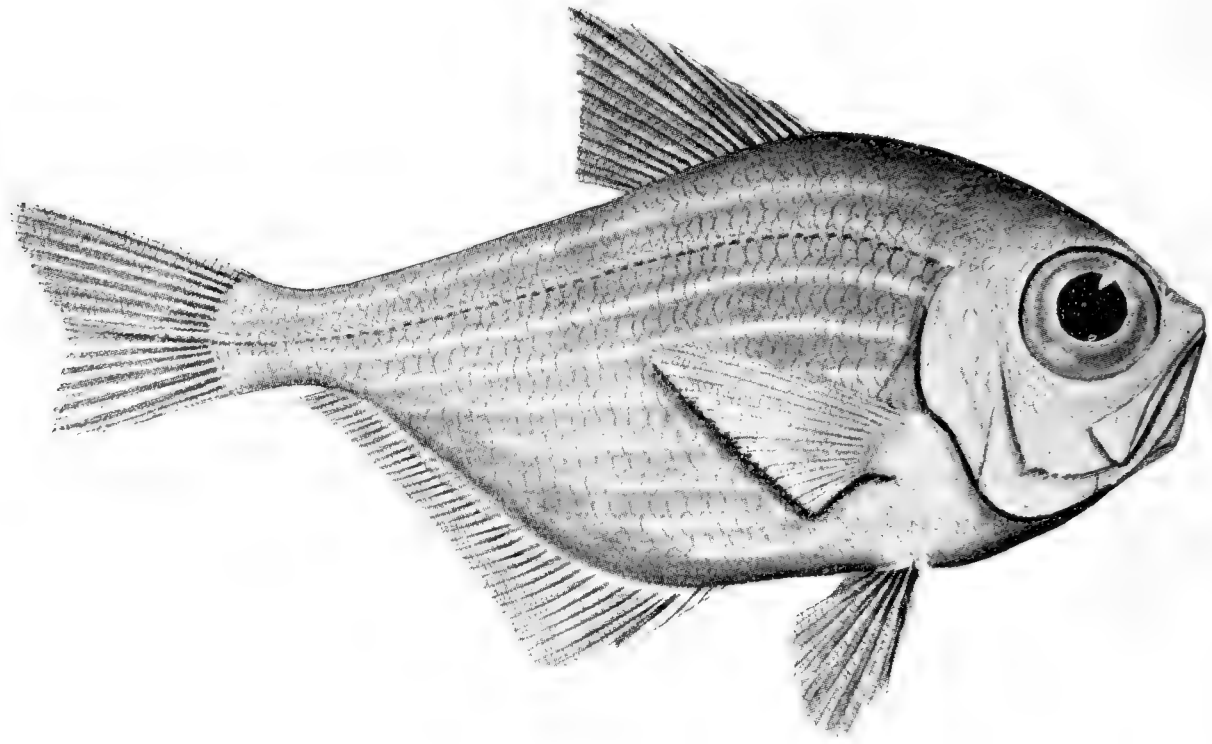


Fig. 168. *Liopempheris multiradiata.*

Members of this Family are not of economic importance.

PEMPHERIS Cuvier, 1829 (argenteus).

PEMPHERIS KLUNZINGERI McCulloch.

Pempheris muelleri Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 380, pl. vi (not Poey).
Pempheris klunzingeri McCull., Endeavour Res., i, 1911, p. 47.

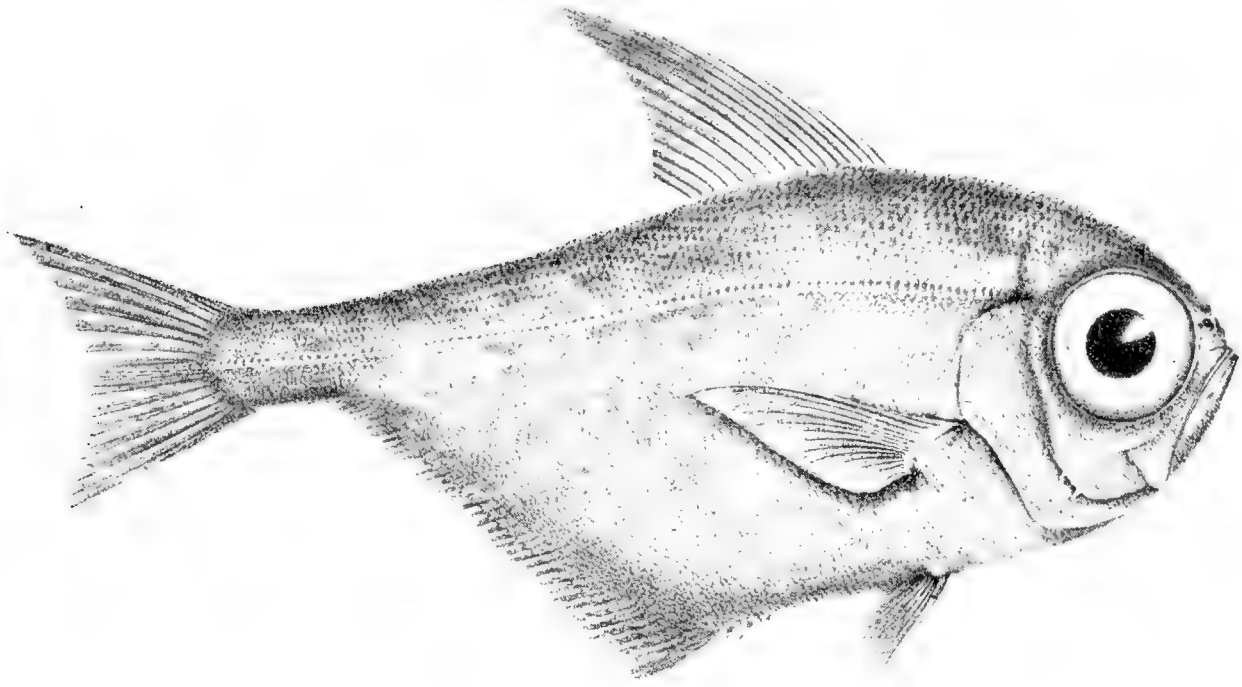


Fig. 169. *Pempheris klunzingeri.*

PARAPRIACANTHUS Steindachner, 1870 (ransonneti).

PARAPRIACANTHUS ELONGATUS McCulloch.

Pempheris elongata McCull., Endeavour Res., i, 1911, p. 47, pl. iv, fig. 1.
Parapriacanthus elongatus Ogil., Mem. Qld. Mus., ii, 1913, p. 67.

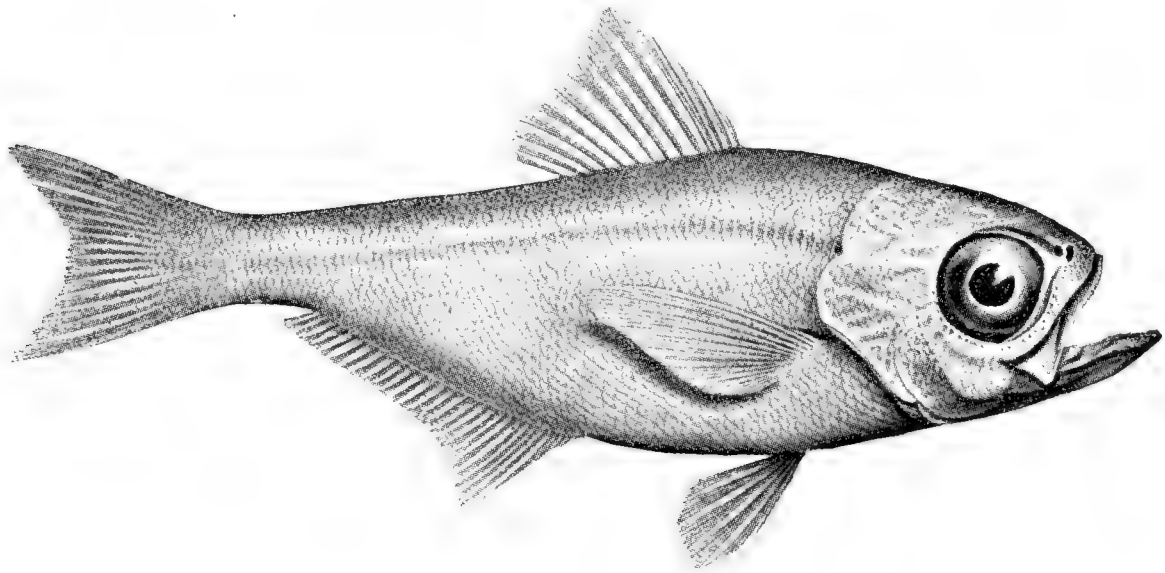


Fig. 170. *Parapriacanthus elongatus.*

FAMILY SCORPIDIDAE.

SCORPIS Cuvier & Valenciennes, 1831 (georgianus).

SCORPIS GEORGIANUS Cuvier & Valenciennes (Banded Sweep).

Scorpis georgianus Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 503, pl. ccxlv; Rich., Zool. Ereb. & Terr., 1848, p. 121.

It is possible that this may prove to be the young of *S. aequipinnis*.

SCORPIS AEQUIPINNIS Richardson (Sweep).

Scorpis aequipinnis Rich., Zool. Ereb. & Terr., 1848, p. 121; Ogil., Edib. Fish. N.S.W., 1893, p. 38, pl. x; McCull., Rec. Aust. Mus., xi, 1917, p. 177, fig. 2; Roughley, Fish. Aust., 1916, p. 141, pl. xlv.

Scorpis lineolatus Kner, Reise Novara, 1865, p. 108, pl. v, fig. 3.

Scorpis boops Peters, Sitzb., Akad. Berlin, 1866, p. 519.

Scorpis richardsonii Steind., Sitz. Akad. Wiss. Wien. liii, 1866, p. 437, pl. v, fig. 1.

Scorpis oblungus Canestrini, Arch. Zool. Anat. (2), i, 1869, p. 153.

Fig. 172. *Scorpis aequipinnis.*

The Sweep is a favourite food and sporting fish, and always find a ready sale.

FAMILY KYPHOSIDAE.

KYPHOSUS Lacepède, 1802 (bigibbus).

KYPHOSUS SYDNEYANUS Günther (Drummer).

Pachymetopon grande Macl., P.L.S., N.S.W., v, 1881, p. 406 (not Günth.).
Pimelepterus sydneyanus Günth., A.M.N.H. (5), xviii, 1886, p. 368; Ogil., Edib. Fish. N.S.W., 1893, p. 40, pl. xvi.
Pimelepterus meridionalis Ogil., P.Z.S., 1886, p. 539.
Kyphosus sydneyanus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 26; Roughley, Fish. Aust., 1916, p. 58, pl. xv; McCull., Rec. Aust. Mus., xiii, 1920, p. 56, pl. xii, fig. 2.

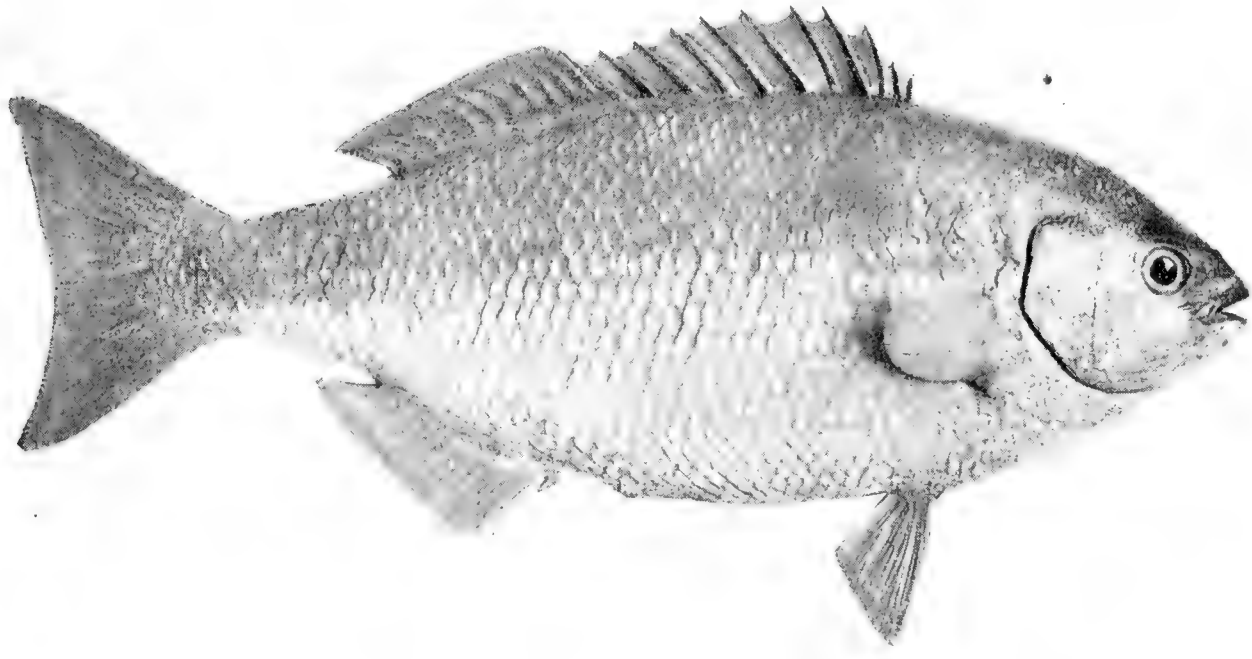


Fig. 173. *Kyphosus sydneyanus.*

Though attaining a length of 30 inches, this fish is not regarded with favour; it does not take an animal bait.

FAMILY GIRELLIDAE.

GIRELLA Gray, 1833 (punctata).

GIRELLA TRICUSPIDATA Quoy & Gaimard (Blackfish).

Boops tricuspidatus Quoy & Gaim., Voy. Uranie & Physic., 1824, p. 296.
Oblata tricuspidata Cuv. & Val., Hist. Nat. Poiss., vi, 1830, p. 372.
Crenidens triglyphus Rich., Zool. Ereb. & Terr., 1845, p. 36, pl. xxv., fig. 2.
Crenidens simplex Rich., *op. cit.*, 1846, p. 120.
Girella tricuspidata Günth., Cat. Fish. Brit. Mus., i, 1859, p. 428; Ogil., Edib. Fish. N.S.W., 1893, p. 42, pl. xii; Stead, Edib. Fish. N.S.W., 1908, p. 49, pl. xix; Roughley, Fish. Aust., 1916, p. 52, pl. xii; McCull, Rec. Aust. Mus., xiii, 1920, p. 60, pl. xiv, fig. 1 (syn.).
Girella simplex Günth., *op. cit.* p. 429; McCoy, Prod. Zool. Vict., dec. viii, 1883, pl. lxxiii; Ogil., Edib. Fish. N.S.W., 1893, p. 44.
Melanichthys tricuspidata and *M. simplex* Cast., P.Z.S., Vict., i, 1872, p. 67, 68.
Melanichthys blackii Cast., *op. cit.*, ii, 1873, p. 41.
Girella percoides Hect., Trans. N.Z. Inst., vii, 1875, p. 243, pl. x, fig. 6d.

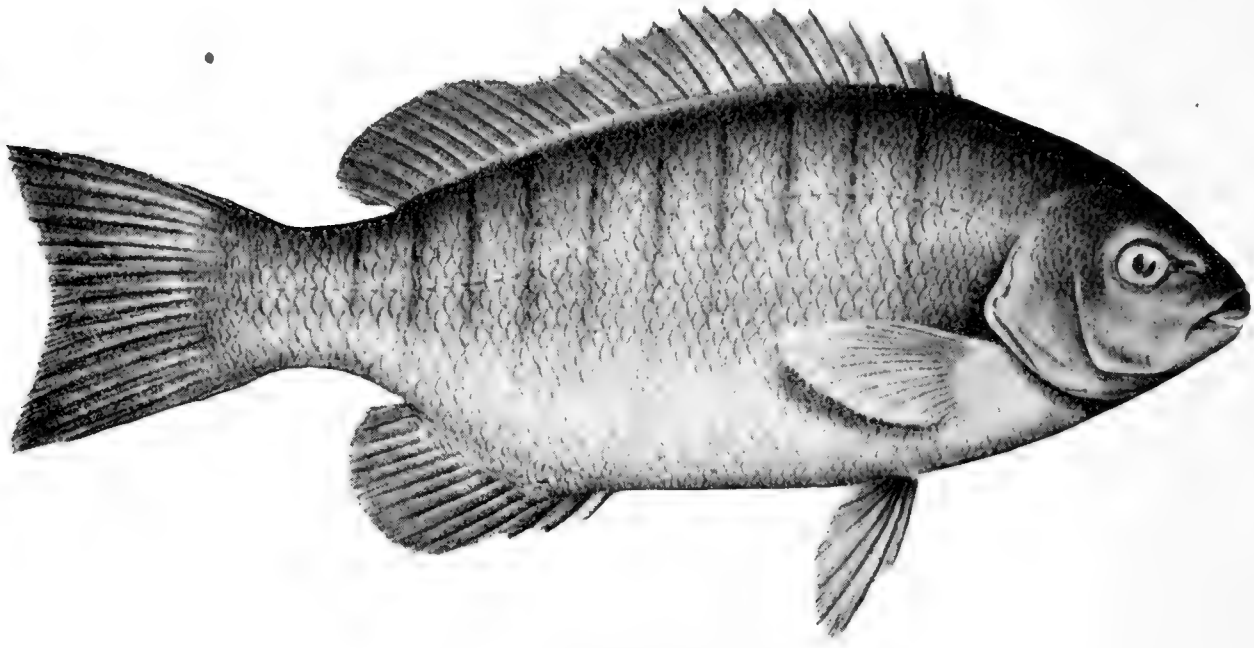


Fig. 174. *Girella tricuspidata.*

Our two species of this Family, being vegetable feeders, are of indifferent flavour and poor keeping quality. They may be caught with seaweed as a bait.

TEPHRAEOPS Günther, 1859 (tephraeops).

TEPHRAEOPS ZEBRA Richardson (Zebra Fish).

Crenidens zebra Rich., Zool. Ereb. & Terr., 1846, p. 70.

Tephraeops zebra Günth., Cat. Fish. Brit. Mus., i, 1859, p. 432.
Girella zebra Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 430, pl. vi, fig. 2.
Girellichthys zebra Klunz., Arch. f. Naturg., xxxviii, 1872, p. 22.
Neotephroeops zebra Cast., P.R.S., Vict., i, 1872, p. 69.
Mclambasis zebra Cast., *op. cit.*, ii, 1873, p. 42.

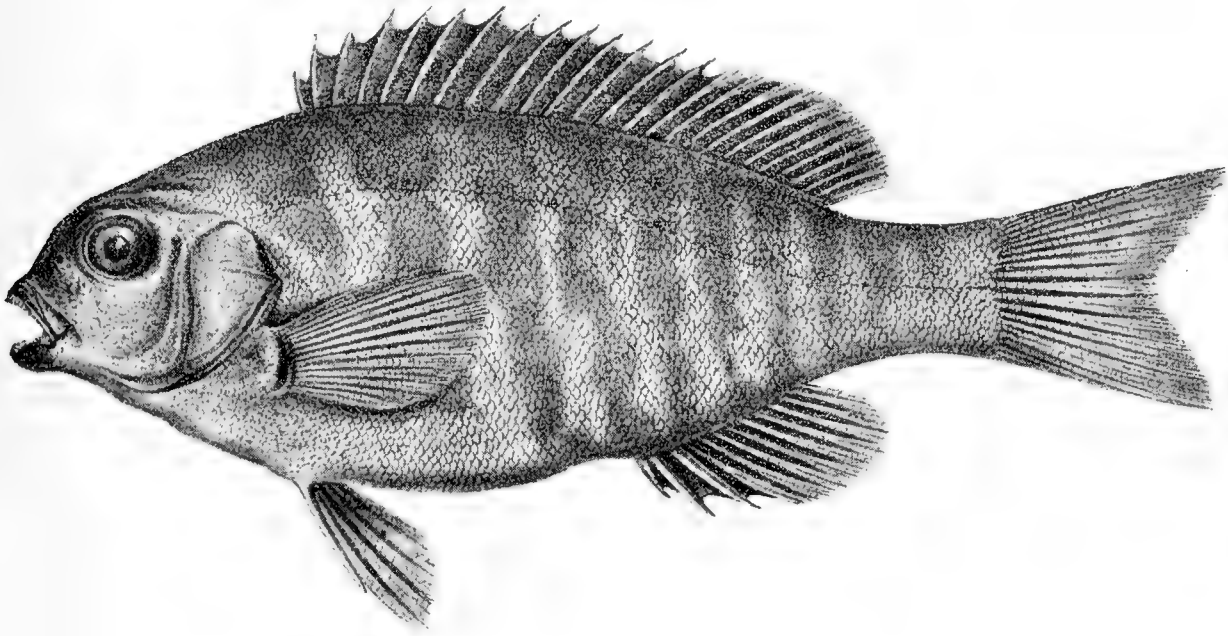


Fig. 175. *Tephraeops zebra.*

FAMILY CHAETODONTIDAE.

VINCULUM McCulloch, 1914 (sexfasciatum).

VINCULUM SEXFASCIATUM Richardson (Six-banded Coral-fish).

Chaetodon sexfasciatus Rich., A.M.N.H., x, 1842, p. 26.
Chaetodon ocellipinnis Macl., P.L.S., N.S.W., iii, 1878, p. 33, pl. iii, fig. 1 (young).
Vinculum sexfasciatum McCull., Endeavour Res., ii, 1914, p. 110, pl. xxii.
Vinculum ocellipinnis McCull., *op. cit.*, iv, 1916, p. 193.

Fig. 176. *Vinculum sexfasciatum.*

A dainty well-fleshed fish, said to be most readily caught at night, whence one of its cognomens, The Moonlighter.

CHELMONOPS Bleeker, 1876 (truncatus).

CHELMONOPS TRUNCATUS Kner.

Chaetodon truncatus Kner, Sitzb. Akad. Wiss. Wien, xxxiv, 1859, p. 442, pl. ii.
Chelmo trochilus Günth., A.M.N.H. (4), xiv, 1874, p. 368.
Chelmonops truncatus Bleek., Arch. Neerl. Sci. Nat., xi, 1876, p. 304.

FAMILY ENOPLOSIDAE.

ENOPLOSUS Lacepède, 1802 (armatus).

ENOPLOSUS ARMATUS Shaw (Old Wife).

Chaetodon armatus Shaw, in White's Voy. N.S.W., 1790, p. 254, pl. xxxix, fig. 1.
Enoplosus white Lacep., Hist. Nat. Poiss., iv, 1803, p. 541.
Enoplosus armatus Cuv. & Val., Hist. Nat. Poiss., ii, 1828, p. 133, pl. xx; Ten. Woods, Fish. N.S.W., 1883, p. 32, pl. ii; Ogil., Edib. Fish. N.S.W., 1893, p. 6; Stead, Edib. Fish. N.S.W., 1908, p. 62, pl. xxxii; Roughley, Fish. Aust., 1916, p. 85, pl. xxvi.

Fig. 178. *Enoplosus armatus.*

A good little fish, but owing to its frequenting rocky localities cannot be taken with a net.

FAMILY HISTIOPTERIDAE.

PENTACEROPSIS Steindachner, 1883 (recurvirostris).

PENTACEROPSIS RECURVIROSTRIS Richardson (Striped Boar-fish).

Histiopterus recurvirostris Rich., Zool. Ereb. & Terr., 1845, p. 34, pl. xxii, fig. 5-6; Canestrini, Arch. Zool. Anat. (2), i, 1869, p. 152, pl. ii.

Pentaceropsis recurvirostris Steind. & Doder., Denkschr. Akad. Wiss. Wien, xlviii, 1883, p. 13 (footnote), pl. vi.

Prosoplismus recurvirostris Waite, Rec. Aust. Mus., v, 1903, p. 58, pl. vi.

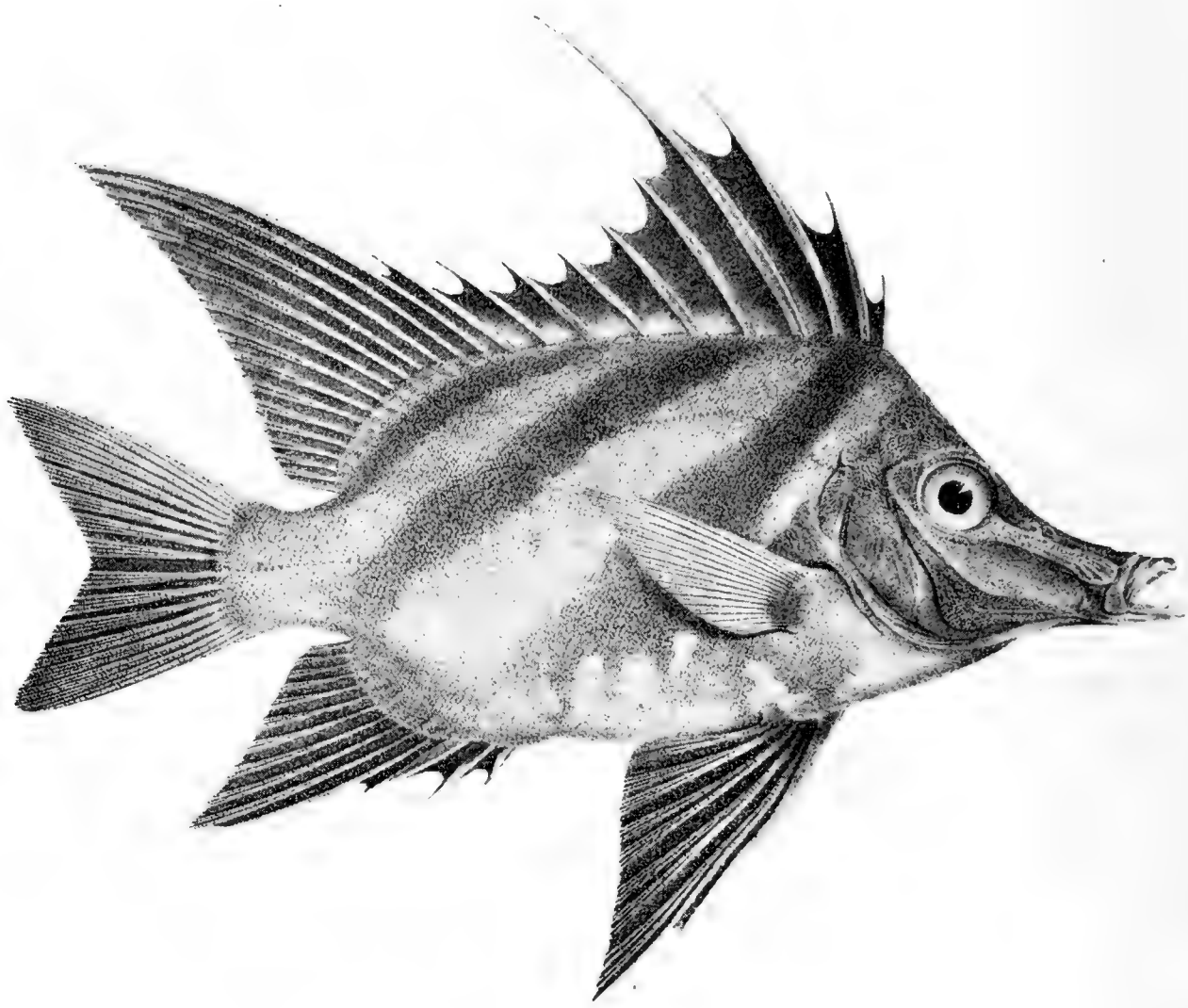


Fig. 179. *Pentaceropsis recurvirostris.*

The Boar-fishes are excellent food, but owing to the non-employment of the trawl are seldom seen in our markets.

ZANCLISTIUS Jordan, 1907 (elevatus).

ZANCLISTIUS ELEVATUS Ramsay & Ogilby (Short Boar-fish).

Histiopterus elevatus Rams. & Ogil., P.L.S., N.S.W. (2), iii, 1888, p. 1311; Waite, Mem. Aust. Mus., iv, 1899, p. 114, pl. xxvi; Stead, Edib. Fish. N.S.W., 1908, p. 75, pl. xliv.

Zanclistius elevatus Jord., Proc. U.S. Nat. Mus., xxxii, 1907, p. 236; McCull., Endeavour Res., i, 1911, p. 67, fig. 14-18.

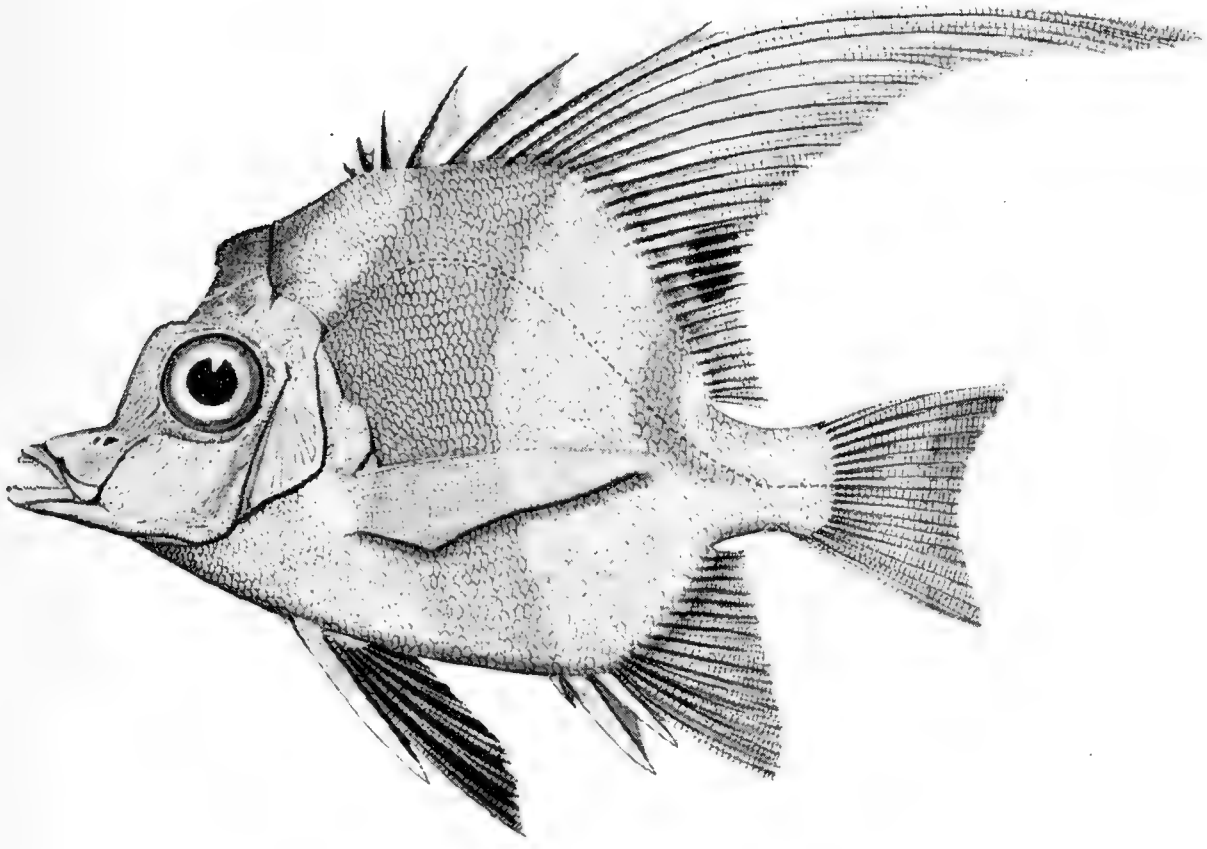


Fig. 180. *Zanclistius elevatus.*

QUINQUARIUS Jordan, 1907 (japonicus).

QUINQUARIUS HENDECACANTHUS McCulloch.

Quinquarius hendecacanthus McCull., Endeavour Res., iii, 1915, p. 144, pl. xxvi, fig. 1-3.

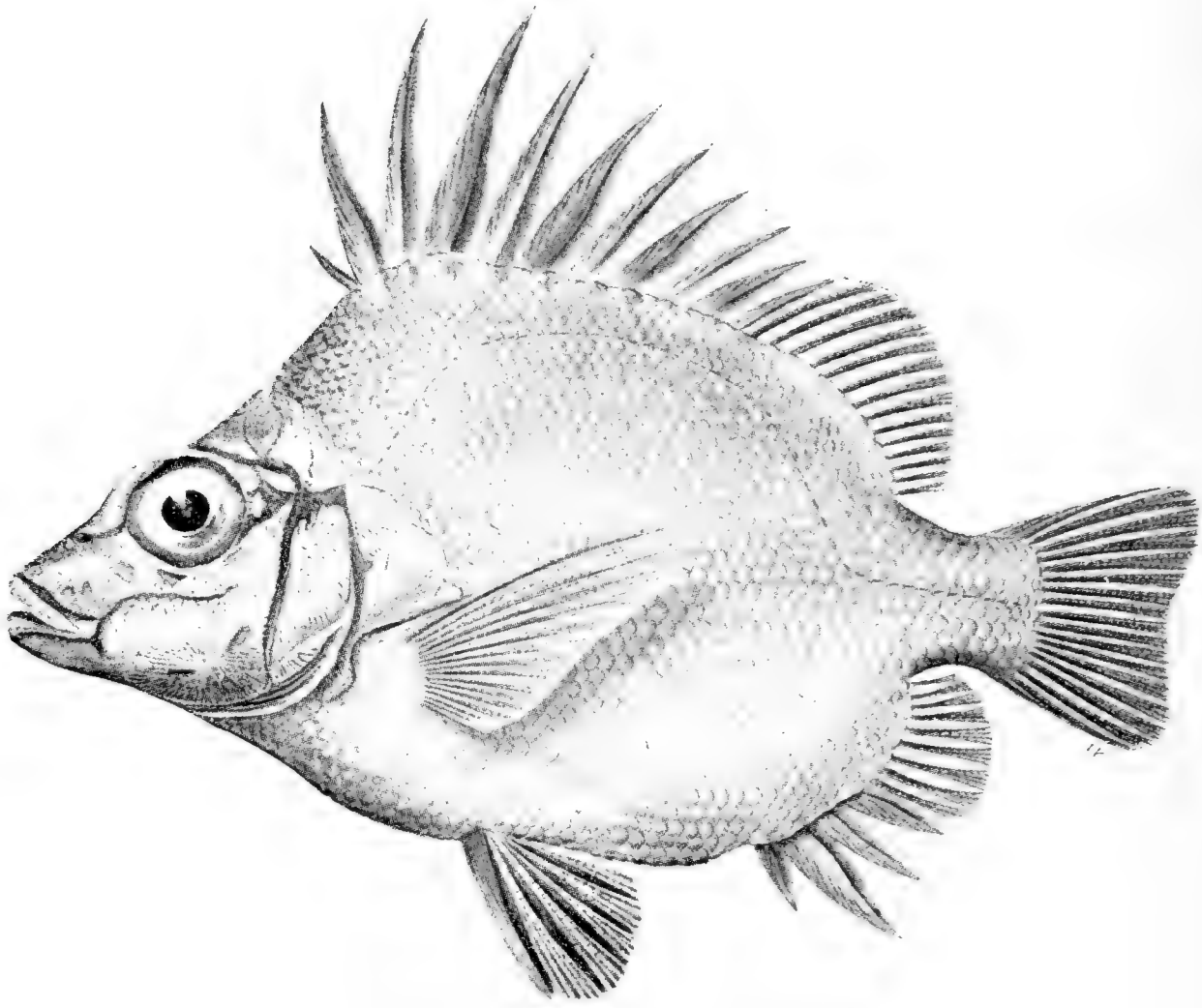


Fig. 181. *Quinquarius hendecacanthus.*

PARISTIOPTERUS Bleeker, 1876 (labiosus).

PARISTIOPTERUS LABIOSUS Günther (Boar-fish).

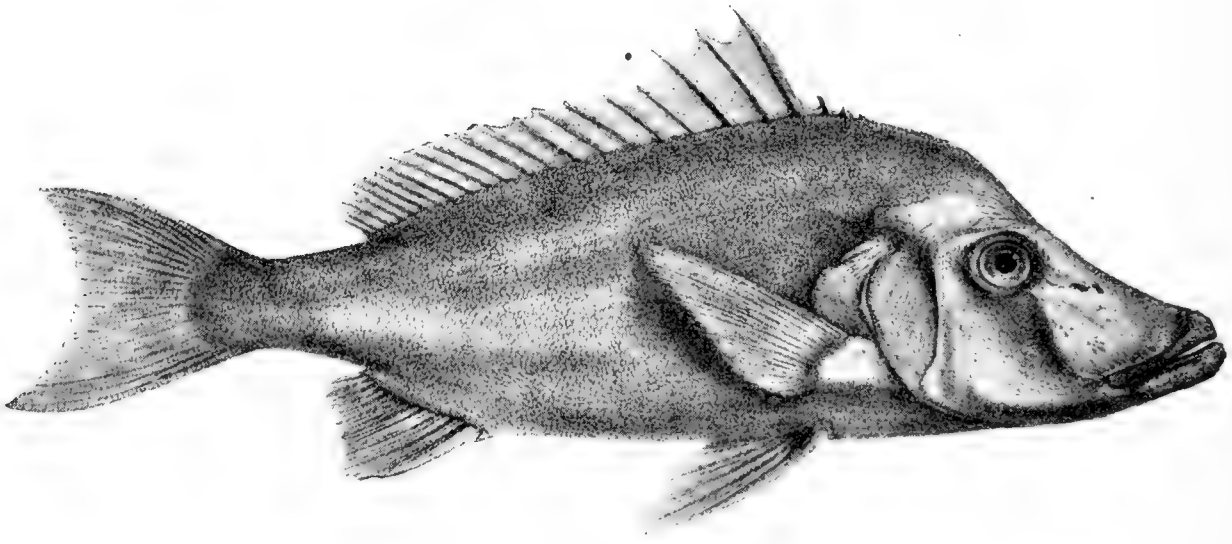


Fig. 182. *Paristiopterus labiosus.*

Histiopterus labiosus Günth., P.Z.S., 1871, p. 658, pl. lix; Ogil., Edib. Fish. N.S.W., 1893, p. 29, pl. vii.

Richardsonia insignis Cast., P.Z.S., Vict., i, 1872, p. 112.

Paristiopterus labiosus Bleek., Arch. Neerl. Sci. Nat., xi, 1876, p. 268.

Histiopterus farnelli Waite, Thetis Prelim. Rep., 1898, p. 33, pl. iv and Mem. Aust. Mus., iv, 1899, p. 116, pl. xxvii.

Maccullochia labiosa Waite, Proc. N.Z. Inst., i, 1910, p. 25; Roughley, Fish. Aust., 1916, p. 127, pl. xli.

FAMILY OPLEGNATHIDAE.

OPLEGNATHUS Richardson, 1840 (conwaii).

OPLEGNATHUS WOODWARDI Waite (Knife-jaw).

Hoplegnathus woodwardi Waite, Rec. Aust. Mus., iii, 1900, p. 212, pl. xxxvii.

Oplegnathus woodwardi Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 464; McCull., Endeavour Res., iv, 1916, p. 187, pl. liv (young).

Hoplegnathus australis Regan, Ann. Durban Mus., i, 1916, p. 169.

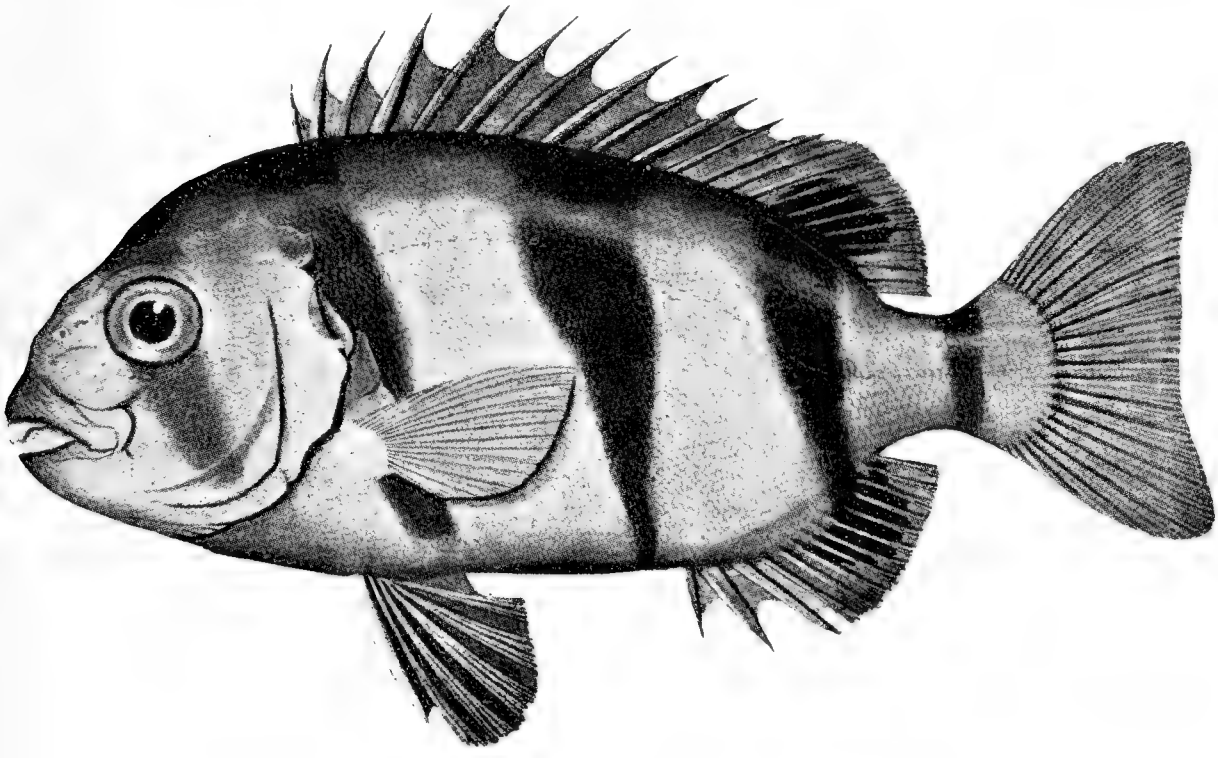


Fig. 183. *Oplegnathus woodwardi.*

Easily recognized from the fact that its teeth are fused into a pair of plates, whence the term Knife-jaw.

FAMILY CEPOLIDAE.

CEPOLA Linnaeus, 1764 (rubescens).

CEPOLA AUSTRALIS Ogilby (Band Fish).

Cepola australis Ogil., P.L.S., N.S.W., xxiv, 1889, p. 185; McCull., Endeavour Res., ii, 1914, p. 109, pl. xxxiv, fig. 1.

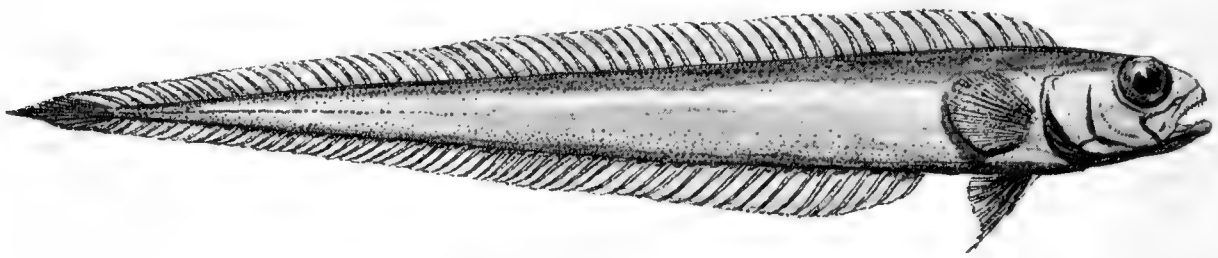


Fig. 184. *Cepola australis.*

DIVISION CIRRHITIFORMES.

FAMILY CHEILODACTYLIDAE.

GONIISTIUS Gill, 1862 (zonatus).

GONIISTIUS VIZONARIUS Kent (Magpie Perch).

Cheilodactylus gibbosus Cast., P.Z.S., Vict., i, 1872, p. 75 (not Rich.).
Chilodactylus vizonarius Kent, P.R.S., Tasm., 1887, p. xxx, 48.

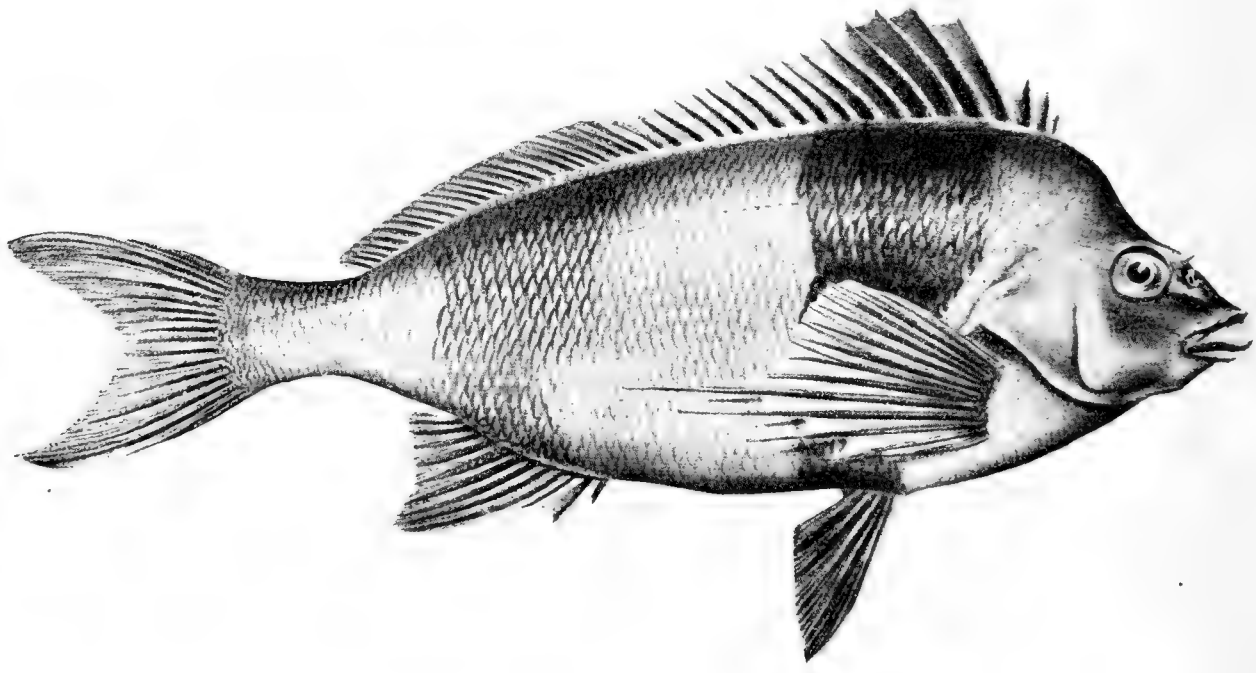


Fig. 185. *Goniistius vizonarius.*

Chilodactylus bizonarius Kent, Nat. in Aust., 1897, p. 165, 166, pl. xxviii, fig. 13.
Goniistius vizonarius McCull., Endeavour Res., i, 1911, p. 64, pl. xi.

The members of this Family may usually be recognized by the fact that the lower rays of the pectoral fin are undivided, one of which is more or less elongated.

DACTYLOPAGRUS Gill, 1862 (carponemus).

DACTYLOPAGRUS CARPONEMUS Cuvier & Valenciennes (Sea-carp).

Cichla macroptera Bl. & Schn., Syst. Ichth., 1801, p. 342 (not Forst.).
Cheilodactylus carponemus Cuv. & Val., Hist. Nat. Poiss., v, 1830, p. 362, pl. cxxviii; McCoy, Prod. Zool. Vict., dec. xviii, 1889, pl. clxxiii, clxxiv.

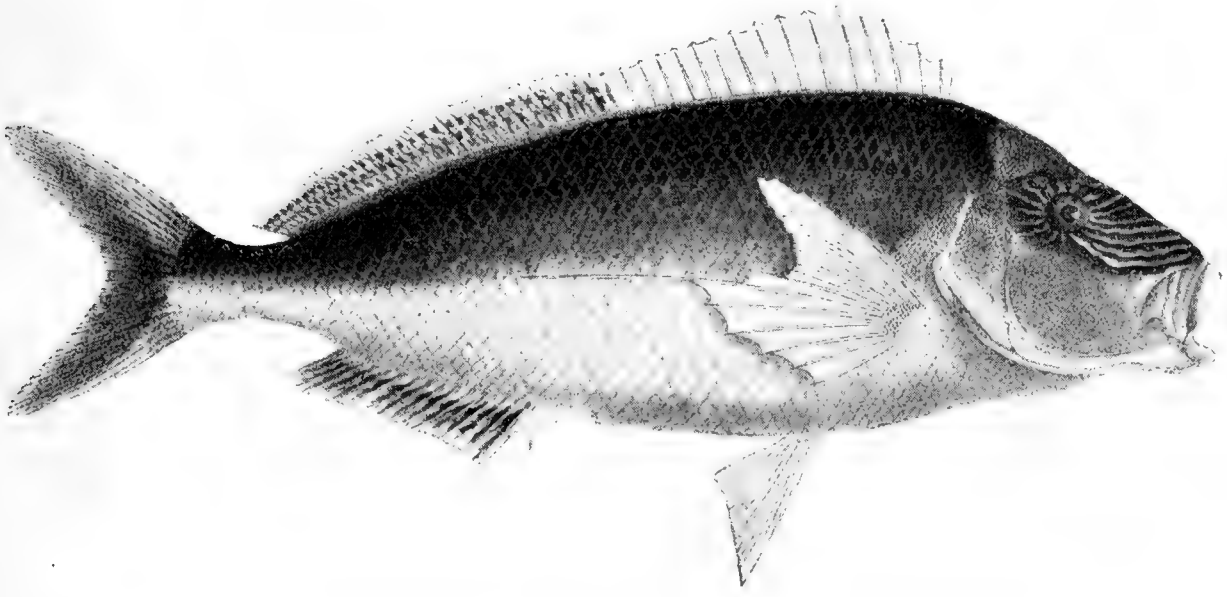


Fig. 186. *Dactylopagrus carponemus.*

It may be noted that references to *D. carponemus* from Eastern Australia are applicable to *D. morrong* Rams. & Ogil.

DACTYLOPAGRUS MACROPTERUS Forster (Jackass Fish).

Sciaena macroptera Forst., in Bl. & Schn., Syst. Ichth., 1801, p. 342.
Cheilodactylus macropterus Rich., P.Z.S., 1850, p. 62; Ogil., Edib. Fish. N.S.W., 1893, p. 57; Ribeiro, Arch. Mus. Nac. Rio Jan., xvii, 1915, Chilod. p. 2, pl.
Dactylosparus macropterus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 32; McCull., Endeavour Res., i, 1911, p. 66, pl. xii.

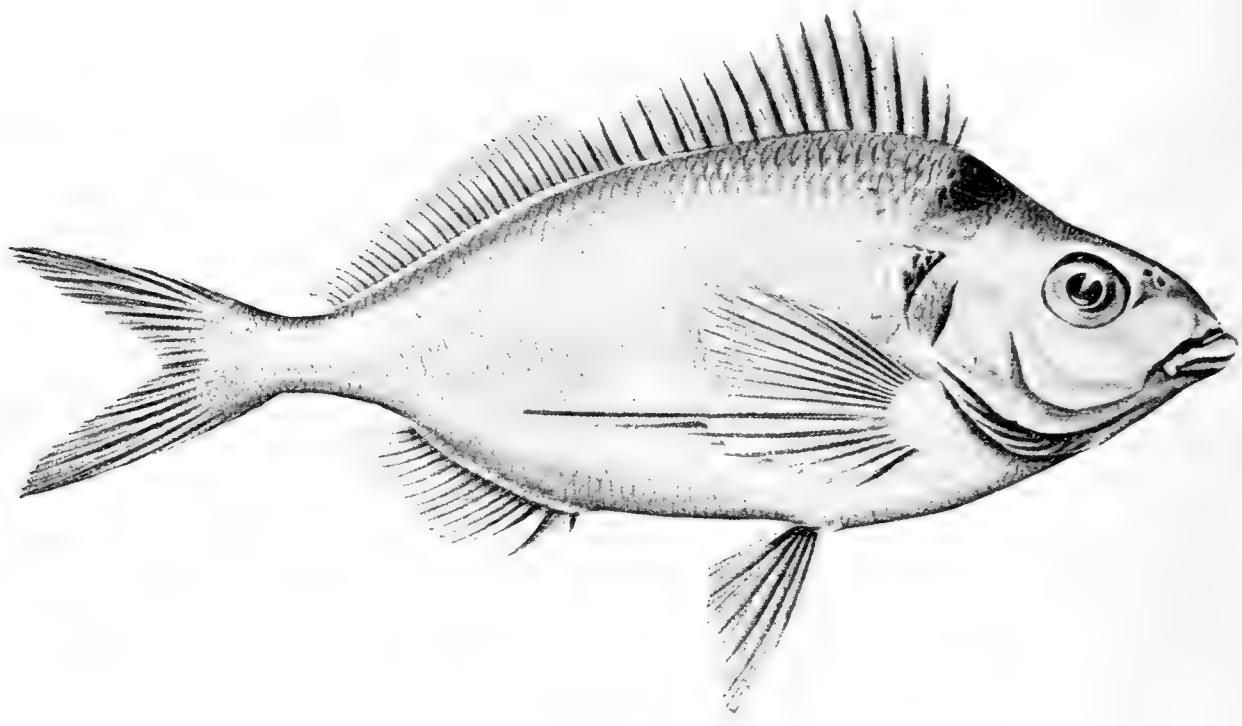


Fig. 187. *Dactylopagrus macropterus.*

Seldom seen here, but one of the commonest food fishes of New Zealand, where it is called The Tarakihi. The name Jackass Fish is in allusion to the cross on the nape.

DACTYLOPHORA De Vis, 1883 (semimaculata=nigricans).

DACTYLOPHORA NIGRICANS Richardson (Strong Fish, Tillywurti).

Cheilodactylus nigricans Rich., P.Z.S., 1850, p. 63.

Chilodactylus nebulosus Klunz., Arch. f. Naturg., xxxviii, 1872, p. 26; Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1078, pl. ii, fig. 1.

Dactylophora semimaculata De Vis, P.L.S., N.S.W., viii, 1883, p. 284.

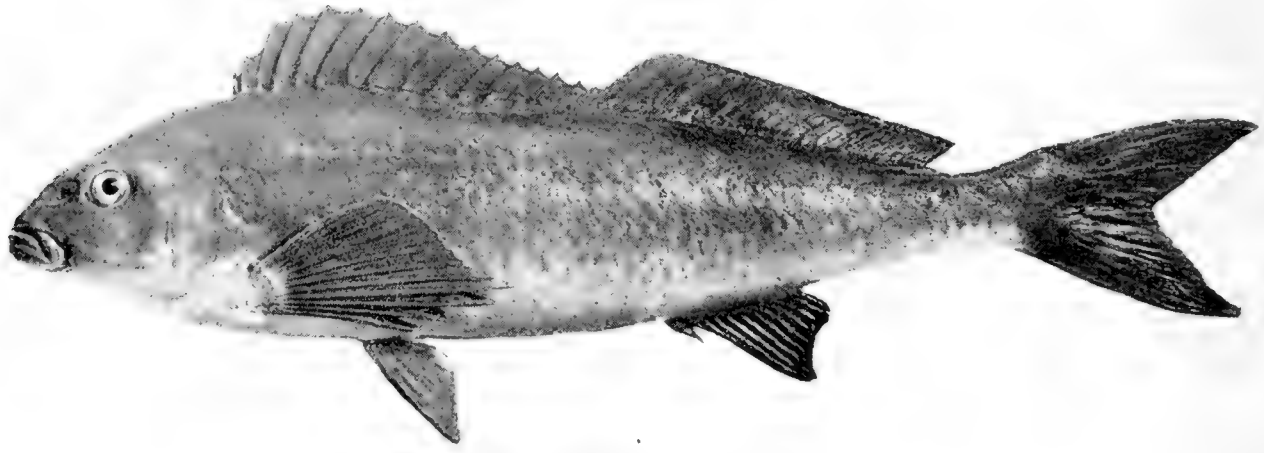


Fig. 188. *Dactylophora nigricans.*

Psilocranium coxii and *P. nigricans* Macl., P.L.S., N.S.W., viii, 1884, p. 440, 441, pl. xxii.
Dactylophora nigricans McCull., Rec. W.A. Mus., i, 1914, p. 217 (syn.).

The best known of our Sea-carps; esteemed as food and reaching a length of about 3 feet.

THREPTERIUS Richardson, 1850 (maculosus).

THREPTERIUS MACULOSUS Richardson.

Threpterius maculosus Rich., P.Z.S., 1850, p. 70, pl. ii, fig. 1, 2.
Chironemus maculosus Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 78.

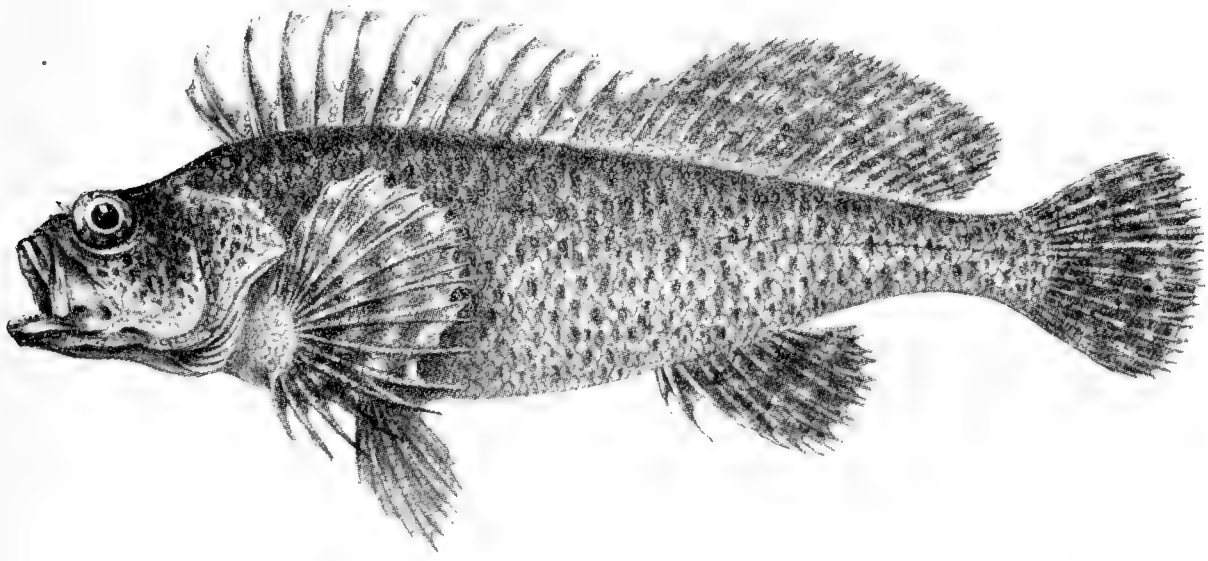


Fig. 189. *Threpterius maculosus.*

FAMILY LATRIDIDAE.

LATRIDOPSIS Gill, 1862 (ciliaris).

LATRIDOPSIS FORSTERI Castelnau (Silver Trumpeter).

Latris forsteri, L. bilineata and *L. inornata* Cast., P.Z.S., Vict., i, 1872, p. 77, 79.
?Latris ramsayi Ogil., P.L.S., N.S.W., x, 1885, p. 229.
Latris ciliaris Waite, Mem. Aust. Mus., iv, 1899, p. 85; Stead, Edib. Fish. N.S.W., 1908, p. 70, pl. xxxix (not Forst.).
Latridopsis forsteri McCull., Endeavour Res., iii, 1915, p. 146, pl. xxvii.

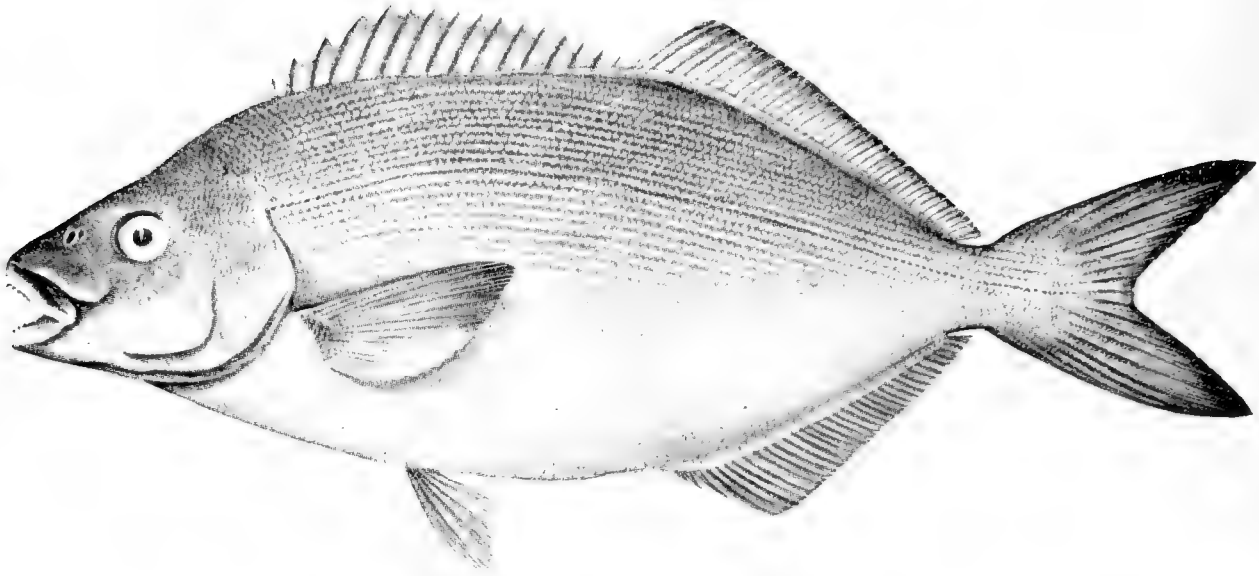


Fig. 190. *Latridopsis forsteri.*

A near relative of the famed "Hobarttown Trumpeter," though not equal to that fish in economic value.

DIVISION POMACENTRIFORMES.

FAMILY POMACENTRIDAE.

PARMA Günther, 1862 (microlepis).

PARMA MICROLEPIS Günther (Puller).

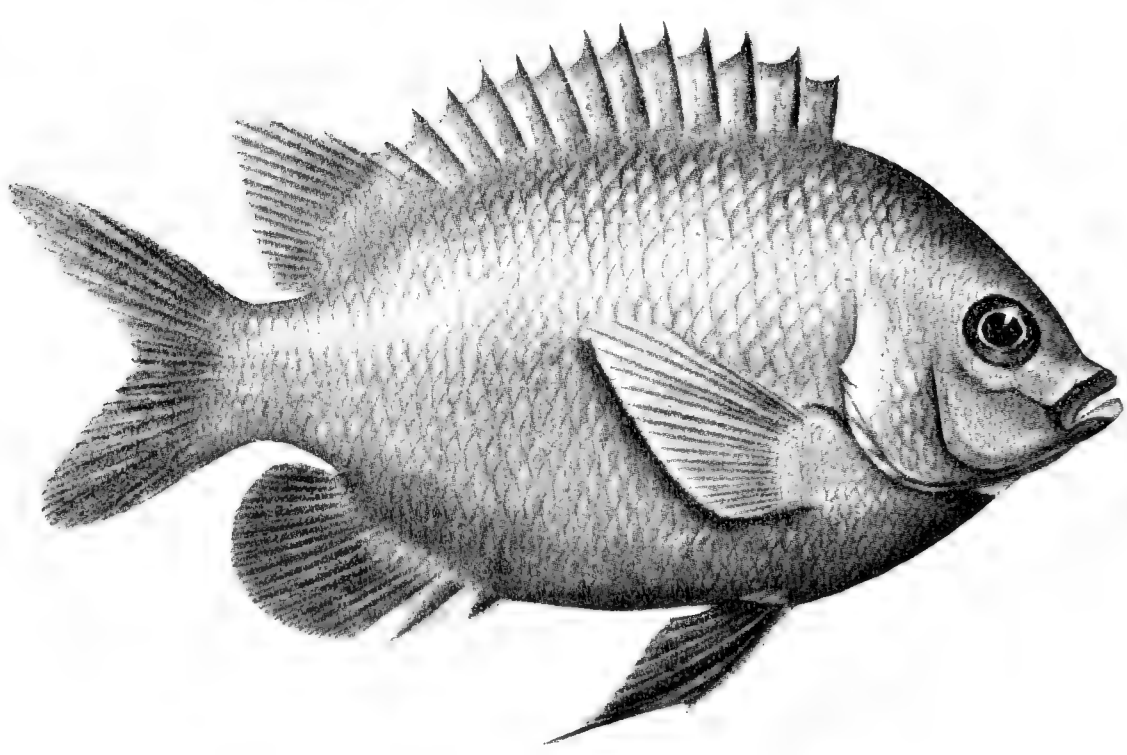


Fig. 191. *Parma microlepis.*

Glyphisodon biocellatus Benn., P.Z.S., 1859, p. 222, pl. ix, fig. A (not Cuv. & Val.).
Parma microlepis Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 57; Stead, Edib. Fish. N.S.W., 1908, p. 81, pl. l.
Parma squamipinnis Günth., *op. cit.*, p. 58, 505.
?Glyphidodon australis Steind., Sitzb. Akad. Wiss. Wien, lvi, 1867, p. 328.
Glyphidodon brownriggii Waite, P.L.S., N.S.W. (2), ix, 1894, p. 219 (not Benn.).
Hypsipops microlepis Waite, Rec. Aust. Mus., vi, 1905, p. 67, pl. xii.

GLYPHISODON Lacepède, 1803 (moucharra).

GLYPHISODON VICTORIAE Günther (Scaly-fin).

Glyphidodon victoriae Günth., A.M.N.H. (3), xi, 1863, p. 115.
Heliastes lividus Klunz., Arch. f. Naturg., xxxviii, 1872, p. 36.
Glyphisodon victoriae McCull. & Waite, Rec. S.A. Mus., i, 1918, p. 46, pl. ii, fig. 2.

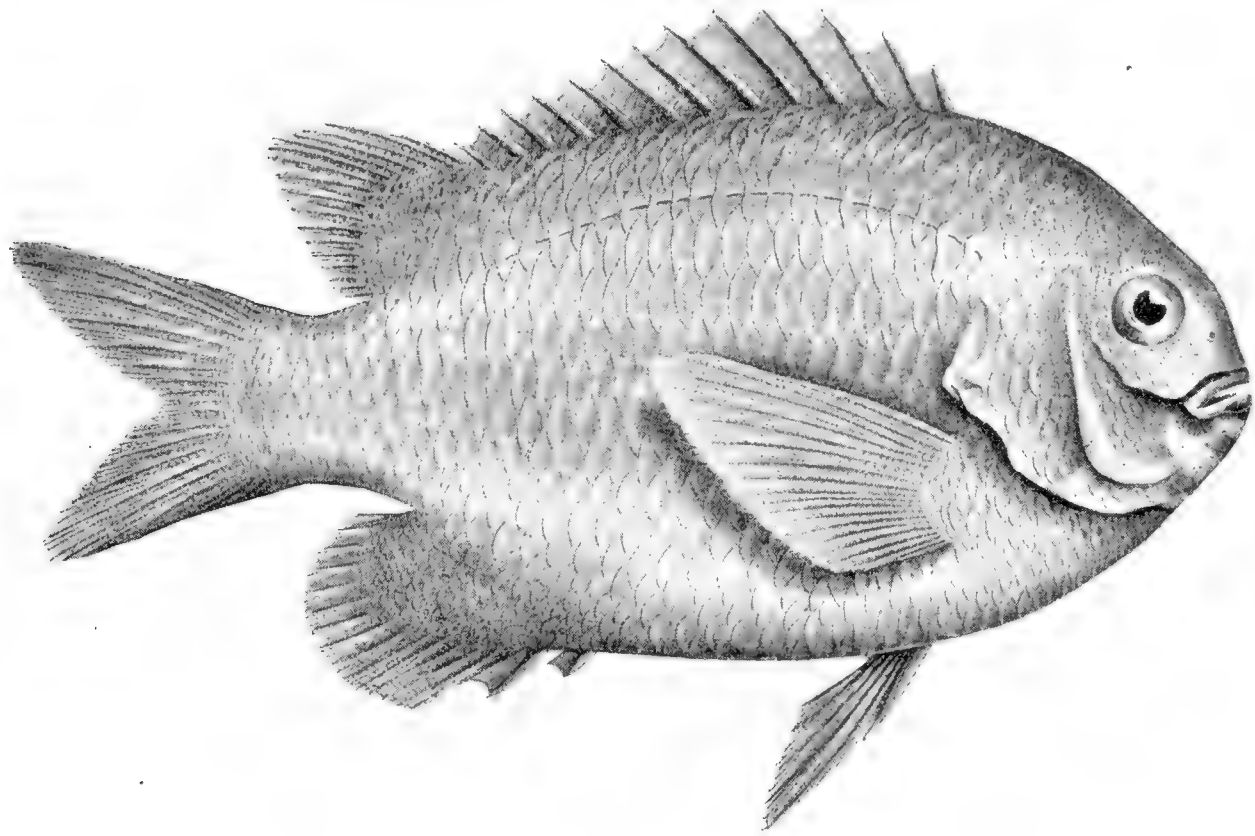


Fig. 192. *Glyphisodon victoriae.*

DIVISION LABRIFORMES.

FAMILY LABRIDAE.

PSEUDOLABRUS Bleeker, 1862 (rubiginosus).

PSEUDOLABRUS PSITTACULUS Richardson.

Labrus psittaculus Rich., P.Z.S., 1840, p. 26 and Zool. Ereb. & Terr., 1848, p. 129, pl. lvi, fig. 7-10.
Labrichthys psittacula Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 114.
Labrichthys rubicunda Macl., P.L.S., N.S.W., vi, 1881, p. 89.
Labrichthys mortonii Johnston, P.R.S., Tasm., 1885, p. 256.
Pseudolabrus psittaculus McCull., Endeavour Res., i, 1911, p. 77, fig. 19.
Pseudolabrus miles McCull., Rec. Aust. Mus., ix, 1913, p. 372 (not Bl. & Schn.).

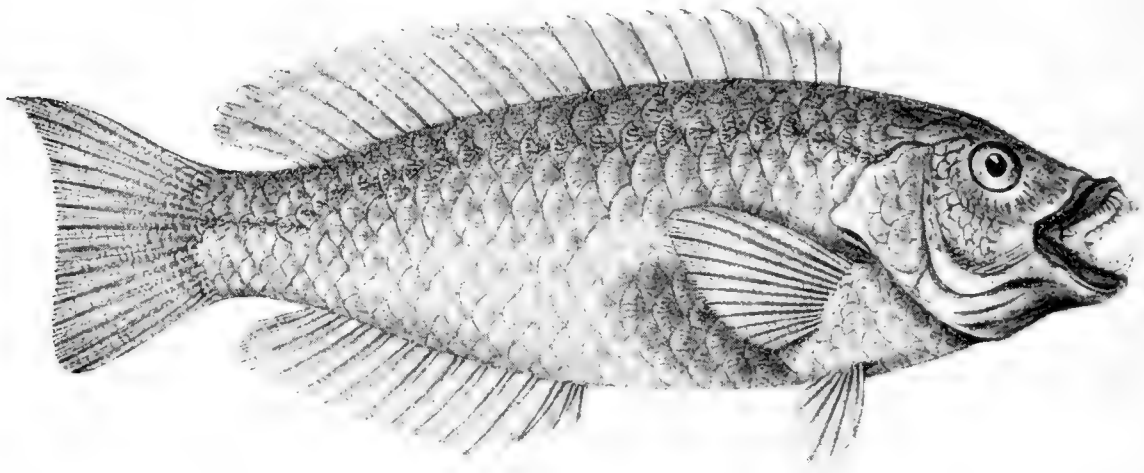


Fig. 193. *Pseudolabrus psittaculus.*

Members of this genus are called Parrot-fishes. Being of herbivorous habit, they do not keep well and are not valued as food.

PSEUDOLABRUS FUCICOLA Richardson.

Labrus fucicola Rich., P.Z.S., 1840, p. 26 and Zool. Ereb. & Terr., 1848, p. 127, pl liv, fig. 1, 2.
Labrichthys fucicola Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 112 (footnote).
Labrichthys bothryocosmos Hutt., Cat. Fish. N.Z., 1872, p. 43, pl. vii, fig. 68 (not Rich.).

Pseudolabrus fucicola Gill, Mem. Nat. Acad. Sci., vi, 1893, p. 116; McCull., Rec. Aust. Mus., ix, 1913, p. 374, pl. xviii.

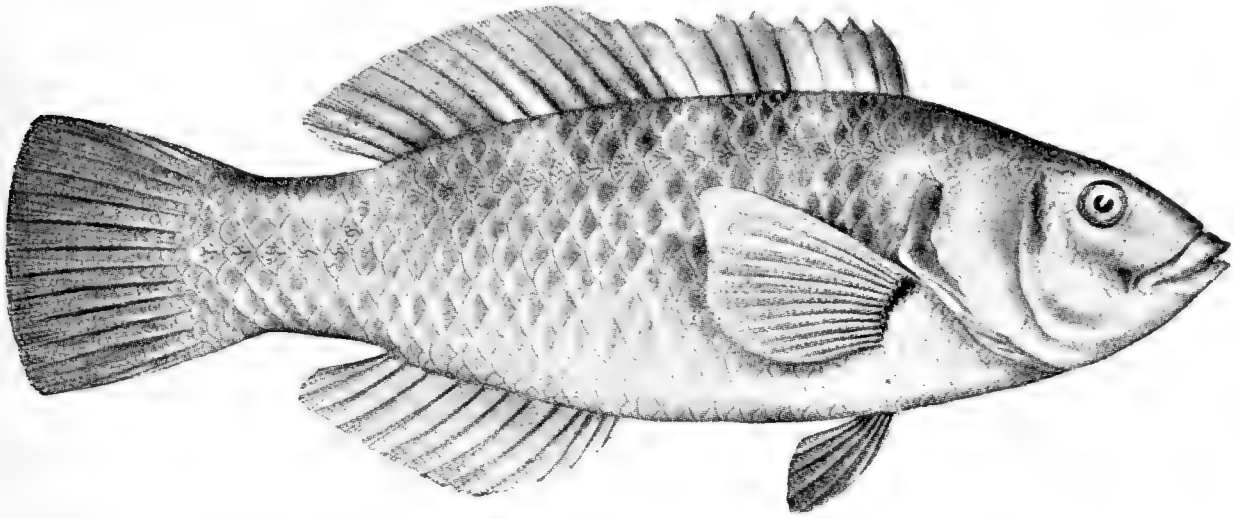


Fig. 194. *Pseudolabrus fucicola.*

PSEUDOLABRUS CELIDOTUS Forster.

Labrus celidotus Forst., in Bl. & Schn., Syst. Ichth., 1801, p. 265; Rich., Zool. Ereb. & Terr., 1848, p. 53, pl. xxxi, fig. 1-5.

Labrus poecilopleura Cuv. & Val., Hist. Nat. Poiss., xiii, 1839, p. 95.

Julis? notatus Rich., A.M.N.H., xi, 1843, p. 425.

Labrus botryocosmus Rich., Zool. Ereb. & Terr., 1848, p. 53, pl. xxxi, fig. 6-10.

Labrichthys celidota Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 113.

Pseudolabrus celidotus Gill, Mem. Nat. Acad. Sci., vi, 1893, p. 98, 117.

Labrichthys bothryocosmus Günth., *op. cit.*, p. 114; Hutt., T.N.Z. Inst., v, 1873, p. 265, pl. x, fig. 68.

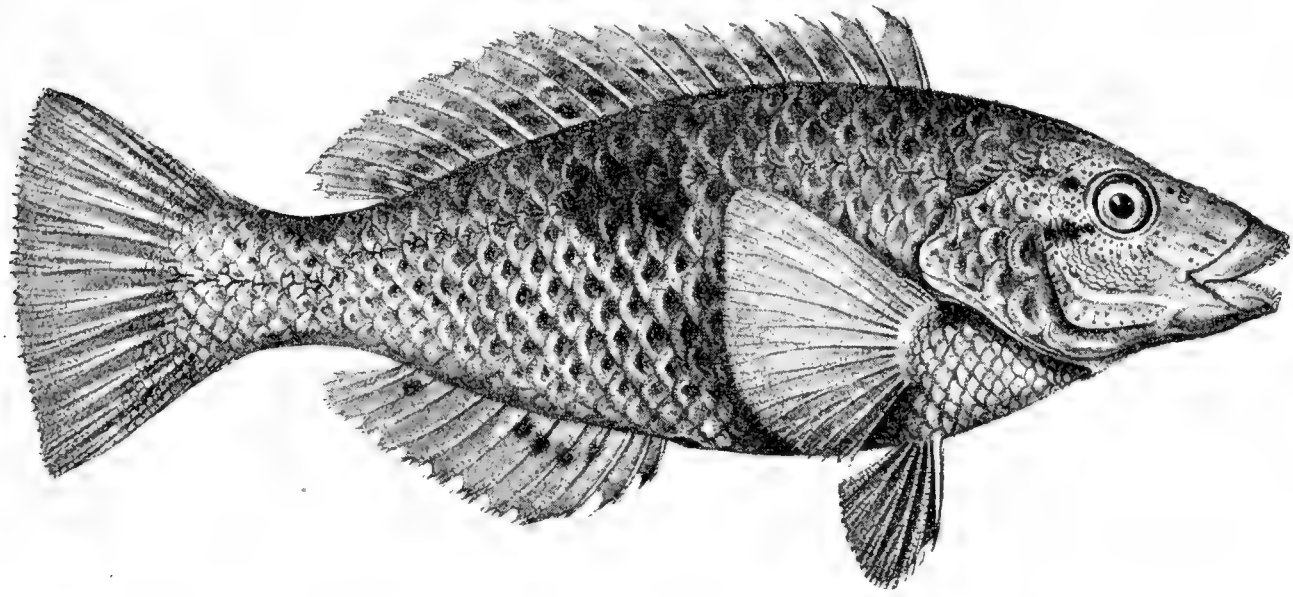


Fig. 195. *Pseudolabrus celidotus.*

PSEUDOLABRUS AURANTIACUS Castelnau.

Cheilinus aurantiacus Cast., P.Z.S., Viet., i, 1872, p. 245.
Labrichthys elegans Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 195 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1102, pl. vi, fig. 2 (male), 3 (female).
Pseudolabrus elegans Gill, Proc. U.S. Nat. Mus., xiv, 1892, p. 403.
Pseudolabrus aurantiacus McCull. & Waite, Rec. S.A. Mus., i, 1918, p. 47.

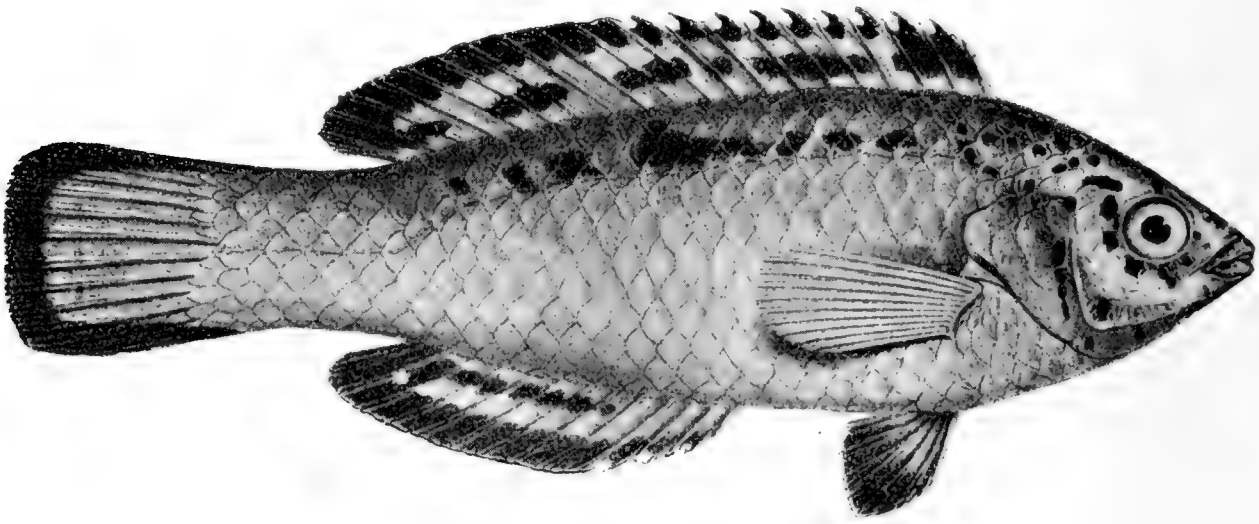


Fig. 196. *Pseudolabrus aurantiacus.*

PSEUDOLABRUS TETRICUS Richardson.

Labrus tetricus Rich., P.Z.S., 1840, p. 25 and Zool. Ereb. & Terr., 1848, p. 126, pl. lv, fig. 1-4.
Labrichthys ephippium Günth., A.M.N.H. (3), xi, 1863, p. 116 (not Cuv. & Val.).

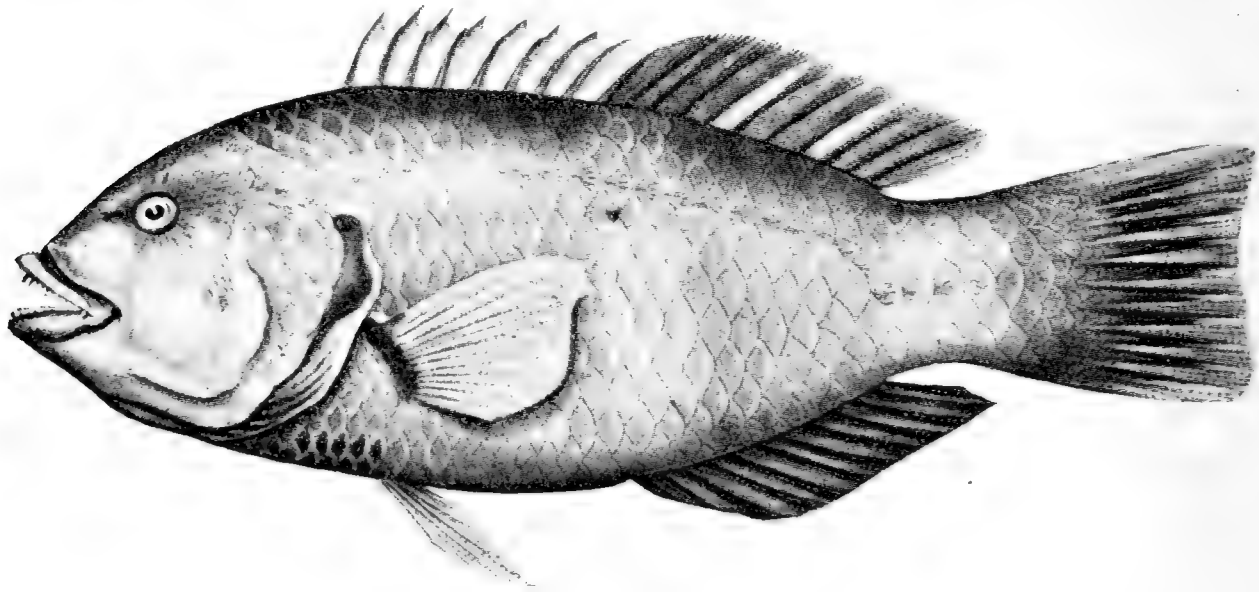


Fig. 197. *Pseudolabrus tetricus.*

Labrichthys tetrica Klunz., Arch. f. Naturg., xxxviii, 1872, p. 37 (with var. *tigripinnis* and *fuscipinnis*) and Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 401 (with var. *ocellata*).

Labrichthys richardsoni and *L. vestita* Cast., P.Z.S., Vict., i, 1872, p. 150, 151.

Labrichthys bleekeri Cast., *op. cit.*, p. 148; McCoy, Prod. Zool. Vict., dec. xiv, 1887, pl. cxxxiv.

?Labrichthys cuvieri Cast., *op. cit.*, ii, 1873, p. 53.

Labrichthys cyanogenys Rams. & Ogil., P.L.S., N.S.W. (2), ii, 1887, p. 242.

Pseudolabrus cyanogenys Gill, P.U.S, Nat. Mus., xiv, 1891, p. 403; McCull., Endeavour Res., i, 1911, p. 76, pl. xiii.

PSEUDOLABRUS PUNCTULATUS Günther.

Labrichthys punctulata Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 118.

Labrichthys edelensis Cast., P.Z.S., Vict., ii, 1873, p. 137.

Pseudolabrus punctulatus Gill, P.U.S. Nat. Mus., xiv, 1892, p. 401; Waite, Rec. Aust. Mus., vi, 1905, p. 69, pl. xiii.

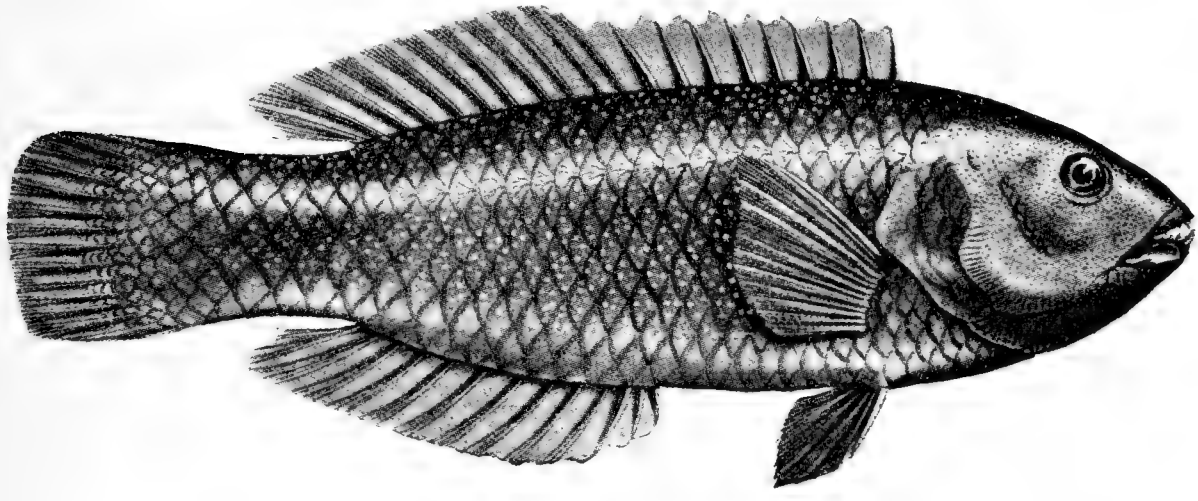


Fig. 198. *Pseudolabrus punctulatus.*

PSEUDOLABRUS MACLEAYI Herzenstein.

Labrichthys macleayi Herz., Ann. Mus. Zool. St. Petersb., i, 1896, p. 10.

PICTILABRUS Gill, 1891 (laticlavius).

PICTILABRUS LATICLAVIUS Richardson (Senator Fish).

Labrus laticlavius Rich, P.Z.S., 1839, p. 99, and Zool. Ereb. & Terr., 1848, p. 128, pl. lvi, fig. 3-6.

Labrichthys laticlavius Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 115, 507; McCoy, Prod. Zool. Viet., dec. xvii, 1888, pl. clxiii.
Labrichthys labiosa Macl., P.L.S., N.S.W., vi, 1881, p. 88, pl. i, fig. 2.
Pictilabrus laticlavius Gill, P.U.S. Nat. Mus., xiv, 1892, p. 403.
Pseudolabrus laticlavius Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 39.

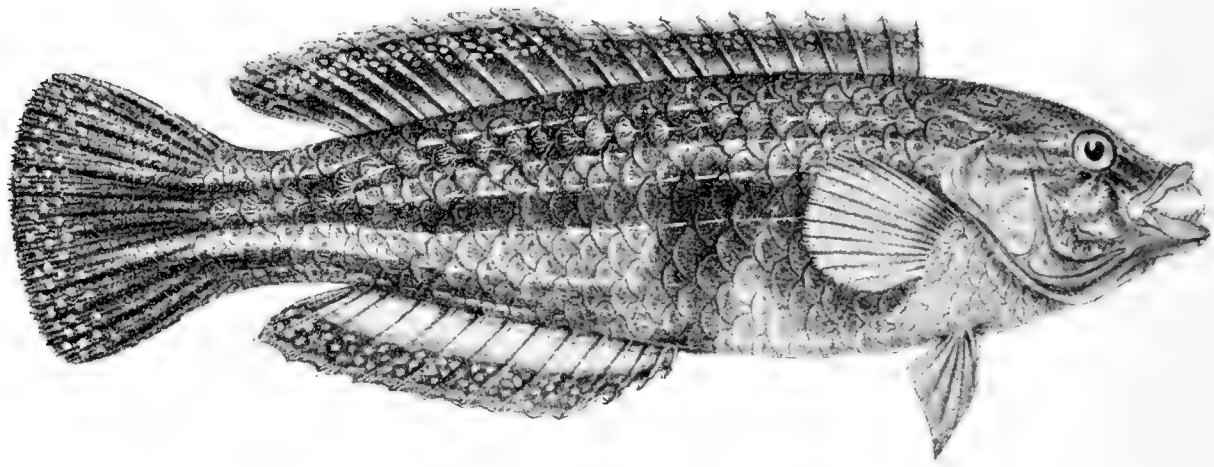


Fig. 200. *Pictilabrus laticlavius.*

AUSTROLABRUS Steindachner, 1884 (maculatus).

AUSTROLABRUS MACULATUS Macleay.

Labrichthys maculata Macl., P.L.S., N.S.W., vi, 1881, p. 89 (not De Vis).
Austrolabrus maculatus Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1100, pl. v (male) and vi fig. 1 (female); McCull., Rec. Aust. Mus., ix, 1913, p 367, pl. xvi.

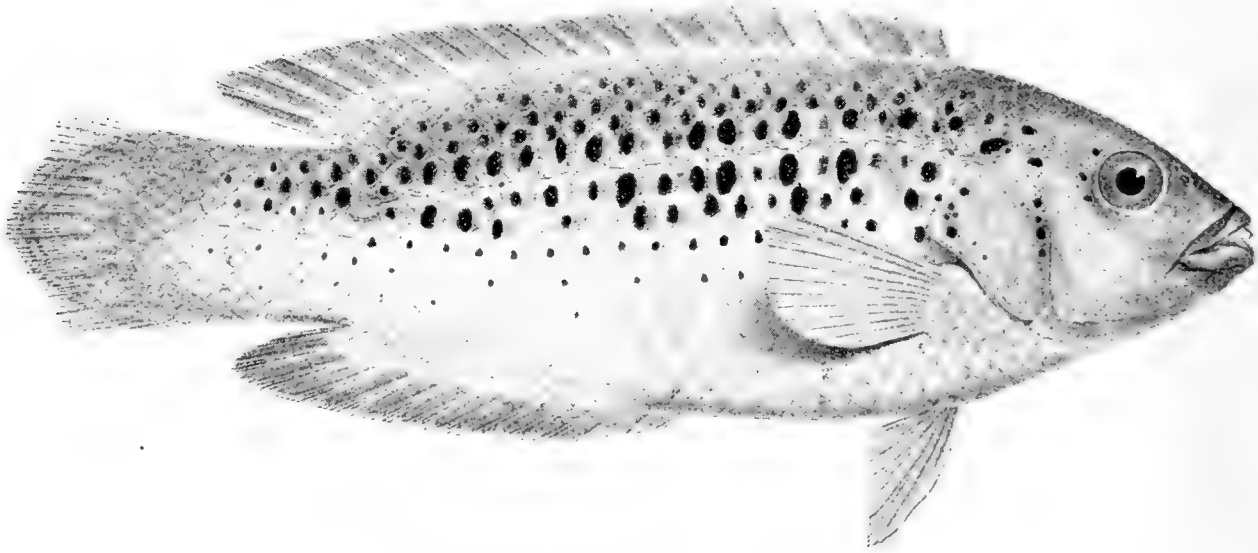


Fig. 201. *Austrolabrus maculatus.*

THALLIURUS Swainson, 1839 (blochi).

THALLIURUS BLEASDALEI Castelnau.

Hemigymnus bleasdalei Cast., Res. Fish. Aust., 1875, p. 38.

OPHTHALMOLEPIS Bleeker, 1861 (lineolatus).

OPHTHALMOLEPIS LINEOLATUS Cuvier & Valenciennes (Maori).

Julis lineolatus Cuv. & Val., Hist. Nat. Poiss., xiii, 1839, p. 436.

Julis cyanogramma Rich., A.M.N.H. (2), vii, 1851, p. 289.

Ophthalmolepis lineolata Bleek., P.Z.S., 1861, p. 413; Roughley, Fish. Aust., 1916, p. 157, pl. liv; Kner, Reise Novara, 1865, p. 258, pl. xi.

Coris lineolata Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 206; Ogil., Edib. Fish. N.S.W., 1893, p. 142; Stead, Edib. Fish. N.S.W., 1908, p. 84, pl. liv.

Julis adelaidensis Cast., Res. Fish. Aust., 1875, p. 35.

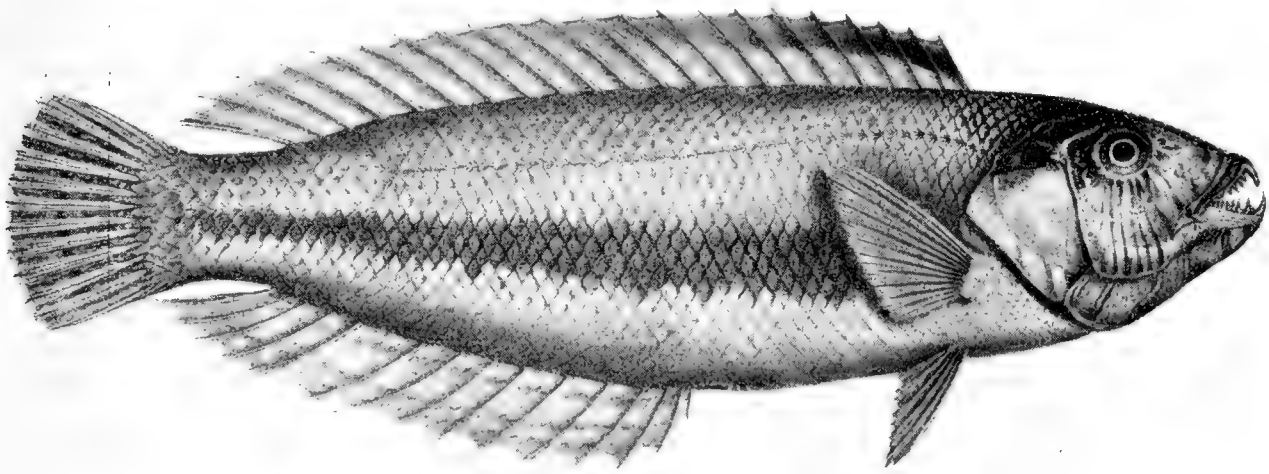


Fig. 203. *Ophthalmolepis lineolatus.*

As food, superior to the Parrot-fishes.

ACHOERODUS Gill, 1863 (gouldii).

ACHOERODUS GOULDII Richardson (Groper).

Labrus gouldii Rich., A.M.N.H., xi, 1843, p. 353.

Cossyphus gouldii Rich., Zool. Ereb. & Terr., 1848, p. 132 and P.Z.S., 1850, p. 72, pl. iii, fig. 3; Ten. Woods, Fish. N.S.W., 1883, p. 74, pl. xxxi.

Achoerodus gouldi Gill, Proc. Acad. Nat. Sci. Phil., xv, 1863, p. 222; Roughley, Fish. Aust., 1916, p. 147, pl. xlviii (Blue form) and xlix (Red form).

Platychoerops muelleri Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 399, pl. viii, fig. 2.

Platychoerops gouldi Ogil., Edib. Fish. N.S.W., 1893, p. 132, pl. xxxv.

Platychoerops badius Ogil., *op. cit.*, p. 134.

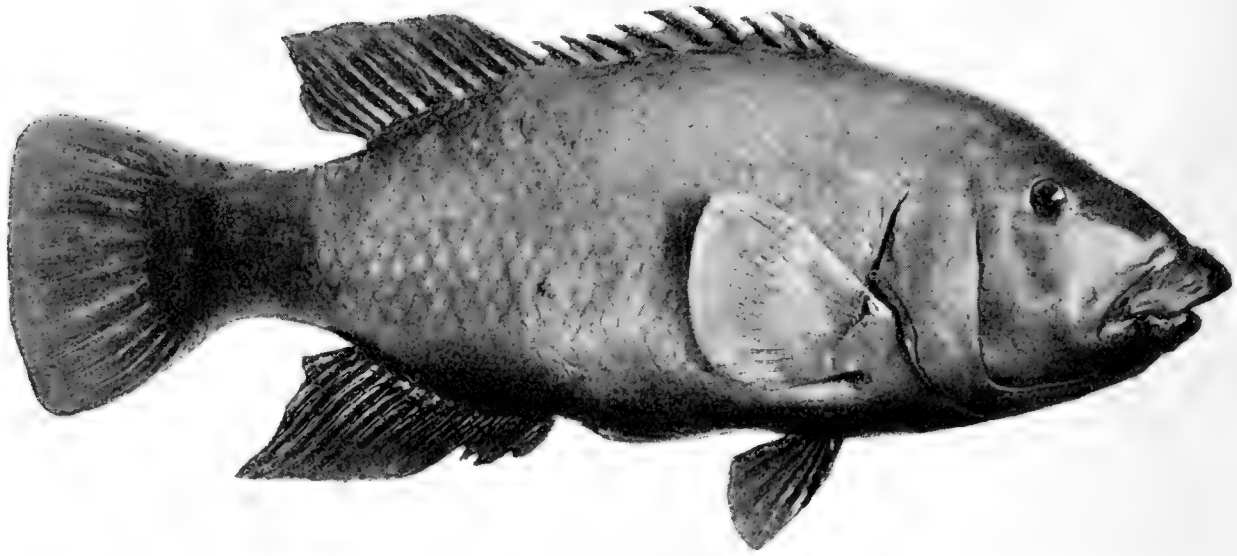


Fig. 204. *Achoerodus gouldii.*

Two colour varieties occur, respectively known as Blue and Red Gropers. Attains a length of 3½ feet and a weight of 40 lb. Not greatly favoured as food.

FAMILY ODACIDAE.

ODAX Cuvier, 1829 (pullus).

ODAX RADIATUS Quoy & Gaimard.

Malacanthus radiatus Quoy & Gaim., Voy Astrolabe, Zool., iii, 1835, p. 717, pl. xix, fig. 2.

Cheilio lineatus Cuv. & Val., Hist. Nat. Poiss., xiii, 1839, p. 354.

Odax lineatus Rich., Zool. Ereb. & Terr., 1848, p. 133, pl. lx, fig. 1-5.

Odax radiatus Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 242.

ODAX RICHARDSONII Günther (Rock Whiting).

Odax pullus Cuv. & Val., Hist. Nat. Poiss., xiv, 1839, p. 304, pl. ccccviii, fig. 1 (not Forst.).

Odax richardsonii Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 241; Roughley, Fish. Aust., 1916, p. 159, pl. lv; Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 404; Ogil., Edib. Fish. N.S.W., 1893, p. 143, pl. xxxvi; Stead, Edib. Fish. N.S.W., 1908, p. 85, pl. lv.

Odax hyrtlii Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 464.

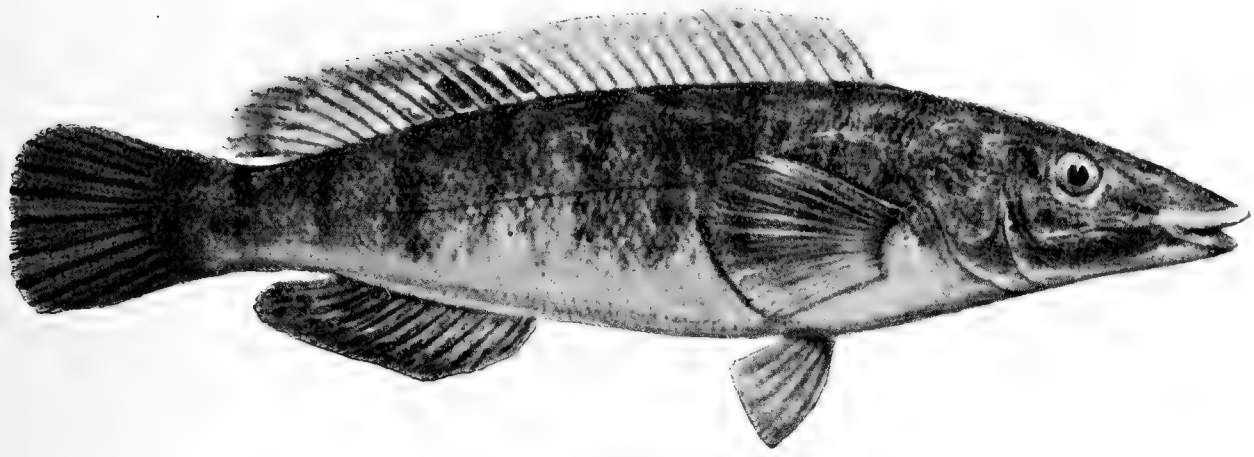


Fig. 206. *Odax richardsonii.*

The Rock Whitings have no affinities with members of the Family *Sillaginidae;* the respective food values are not comparable.

ODAX FRENATUS Günther.

Odax frenatus Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 241.

ODAX PUSILLUS Castelnau.

Odax pusillus Cast., P.Z.S., Viet., ii, 1873, p. 72.

ODAX WATERHOUSII Castelnau.

Neodax waterhousii Cast., Res. Fish. Aust., 1875, p. 37.
Odax waterhousei Macl., P.L.S., N.S.W., vi, 1881, p. 109.

OLISTHOPS Richardson, 1850 (cyanomelas).

OLISTHOPS CYANOMELAS Richardson (Herring Cale).

Olisthops cyanomelas Rich., P.Z.S., 1850, p. 75, pl. iii, fig. 1, 2; Ogil., Edib. Fish. N.S.W., 1893, p. 145; Stead, Edib. Fish. N.S.W., 1908, p. 85, pl. lvi; McCull., Rec. Aust. Mus., xiii, 1920, p. 69, pl. xiv, fig. 3.
Olistherops brunneus Macl., P.L.S., N.S.W., iii, 1878, p. 36, pl. v, fig. 1.
Olistherops brownii Johnst., P.R.S., Tasm., 1884, p. 193.

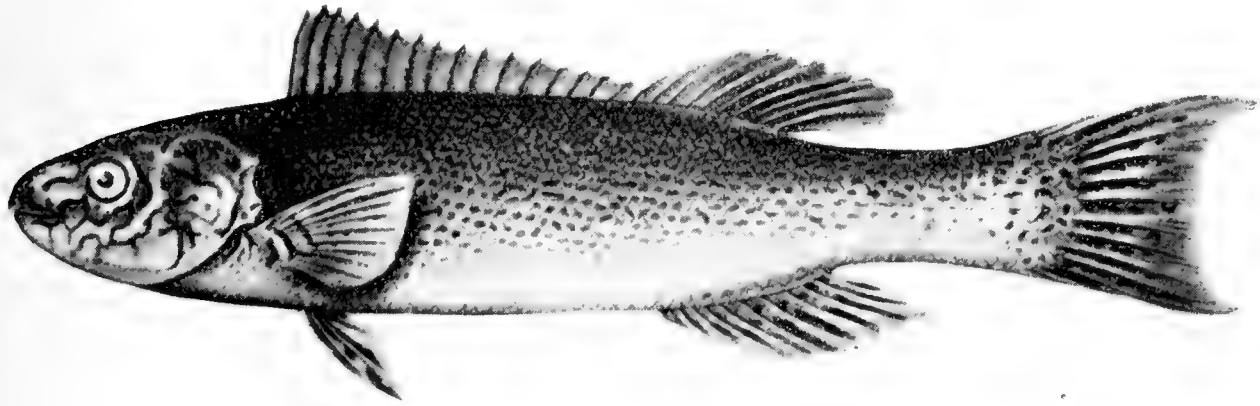


Fig. 210. *Olisthops cyanomelas.*

SIPHONOGNATHUS Richardson, 1857 (argyrophanes).

SIPHONOGNATHUS ARGYROPHANES Richardson (Tube-mouth).

Siphonognathus argyrophanes Rich., P.Z.S., 1857, p. 238, pl. vi.

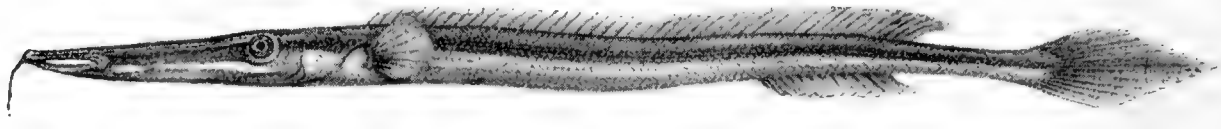


Fig. 211. *Siphonognathus argyrophanes.*

Lives among seaweed; of no economic value.

FAMILY SCARIDAE.

PSEUDOSCARUS Bleeker, 1861 (microrhinos).

PSEUDOSCARUS MODESTUS Castelnau.

Pseudoscarus modestus Cast., Res. Fish. Aust., 1875, p. 41.

Members of the Families *Odacidae* and *Scaridae* differ from those of the *Labridae* by having the teeth in each jaw united to form a sharp-edged plate.

PSEUDOSCARUS DUMERILII Castelnau.

Pseudoscarus dumerilii Cast., Res. Fish. Aust., 1875, p. 41.

HETEROSCARUS Castelnau, 1872 (filamentosus).

HETEROSCARUS FILAMENTOSUS Castelnau (Rainbow-fish).

Heteroscarus filamentosus Cast., P.Z.S., Viet., i, 1872, p. 246 and ii, 1873, p. 74; Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1092, pl. iii, fig. 1 (male).
Heteroscarus modestus Cast., *op. cit.*, i, p. 246 and ii, p. 75.
?Heteroscarus castelnaui Macl., P.L.S., N.S.W., iii, 1878, p. 36, pl. v, fig. 2; Steind., *op. cit.*, p. 1095, 1097, pl. iv (female) and *(H. elegans)*, iii, fig. 2 (young).
?Heteroscarus tenuiceps De Vis, P.L.S., N.S.W., ix, 1885, p. 883.

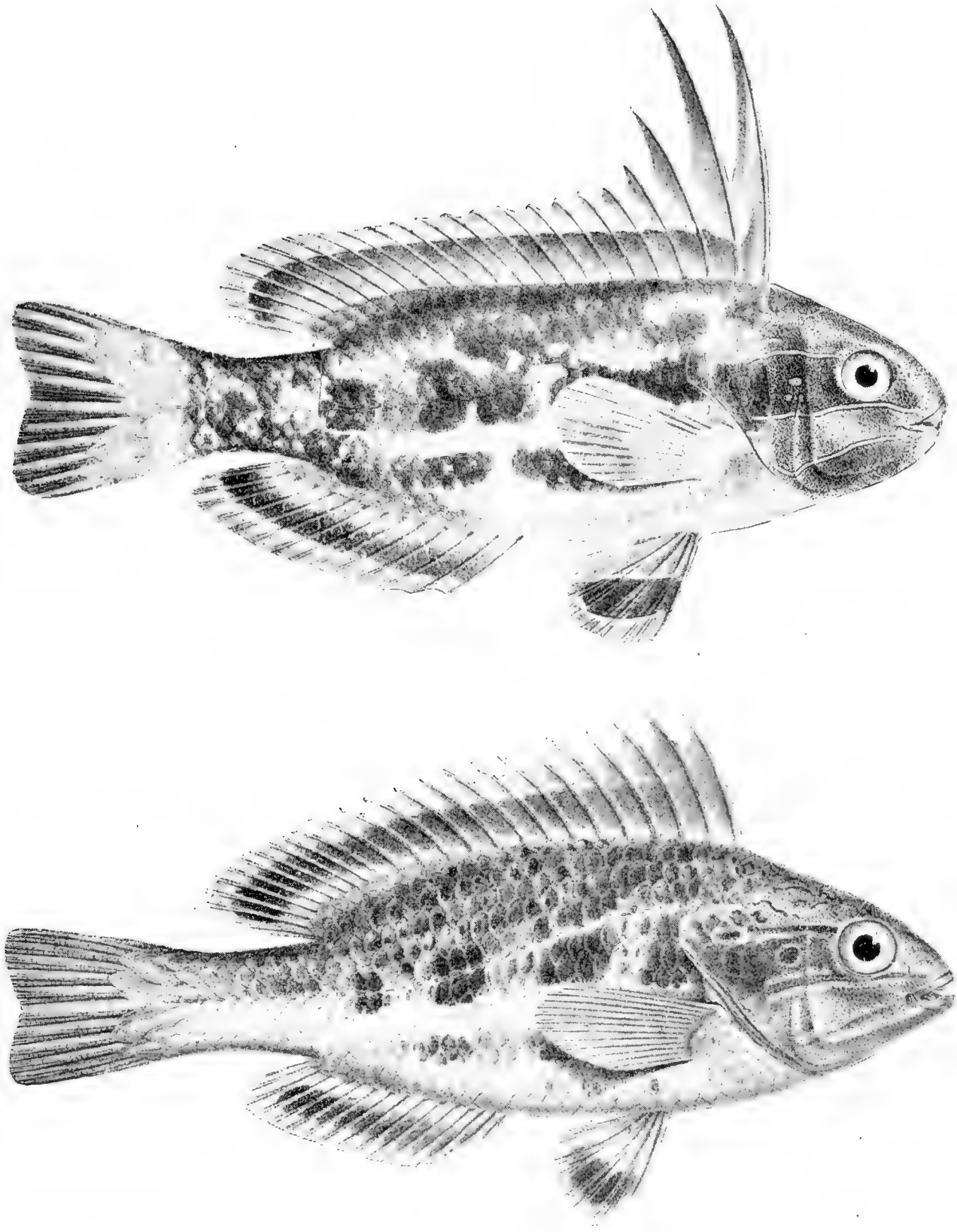


Fig. 214. *Heteroscarus filamentosus* male and female.

One of our most gorgeous fishes. Illustrated on the coloured frontispiece.

DIVISION GADOPSIFORMES.

FAMILY GADOPSIDAE.

GADOPSIS Richardson, 1848 (marmoratus).

GADOPSIS MARMORATUS Richardson (Slippery, River Blackfish).

Gadopsis marmoratus Rich., Zool. Ereb. & Terr., 1848, p. 122, pl. lix, fig. 6-11; Ogil., Edib. Fish. N.S.W., 1893, p. 149 and Mem. Qld. Mus., ii, 1913, p. 69, pl. xx (syn. and econ. hist.); Stead, Edib. Fish. N.S.W., 1908, p. 116, pl. lxxx.

Gadopsis gracilis McCoy, Prod. Zool. Viet., dec. iii, 1879, pl. xxvii, fig. 2.

Gadopsis gibbosus McCoy, *op. cit.*, p. 41.

Gadopsis fuscus Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1105, pl. i, fig. 2.

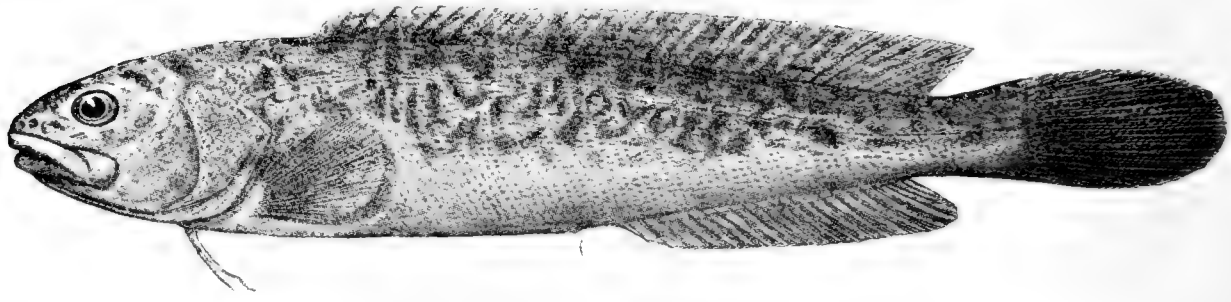


Fig. 215. *Gadopsis marmoratus.*

Attains a length of 25 inches in Victoria; specimens over 10 inches are unknown in our streams.

DIVISION TRACHINIFORMES.

FAMILY PINGUIPEDIDAE.

NEOPERCIS Steindachner & Döderlein, 1884 (ramsayi).

NEOPERCIS RAMSAYI Steindachner.

Percis ramsayi Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 194.

Parapercis ramsayi Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1072.

Percis novae-cambriae Ogil., P.L.S., N.S.W., x, 1885, p. 228.

Parapercis novae-cambriae Waite, Mem. Aust. Mus., iv, 1899, p. 111, pl. xxv.

Neopercis novae-cambriae Waite, Rec. Aust. Mus., v, 1904, p. 237.

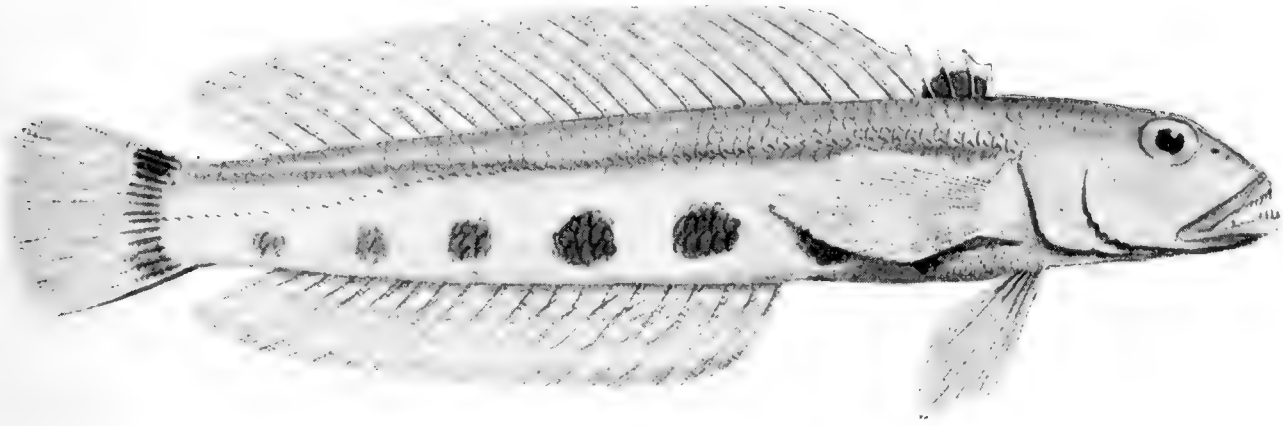


Fig. 216. *Neoperceis ramsayi.*

Our members of this Family are fleshy little fishes, but are not taken in sufficient numbers to be generally used as food.

NEOPERCIS HAACKEI Steindachner.

Percis haackei Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1070.
Neoperceis haackei Steind. & Döder., Denk. Akad. Wiss. Wien, xlix, 1884, p. 212.
Parapercis haackei McCull., Endeavour Res., ii, 1914, p. 155, pl. xxxiv, fig. 2.

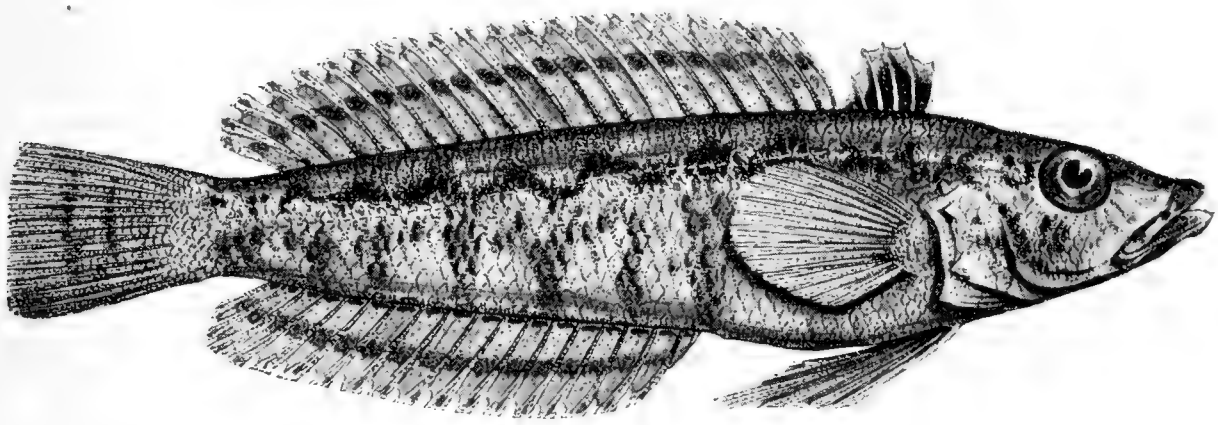


Fig. 217. *Neoperceis haackei.*

NEOPERCIS ALLPORTI Günther.

Percis allporti Günth., A.M.N.H. (4), xvii, 1876, p. 394.
Parapercis ocularis Waite, Mem. Aust. Mus., iv, 1899, p. 109, pl. xxiv.
Neopercis allporti Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 50.
Parapercis allporti McCull., Endeavour Res., ii, 1914, p. 157.

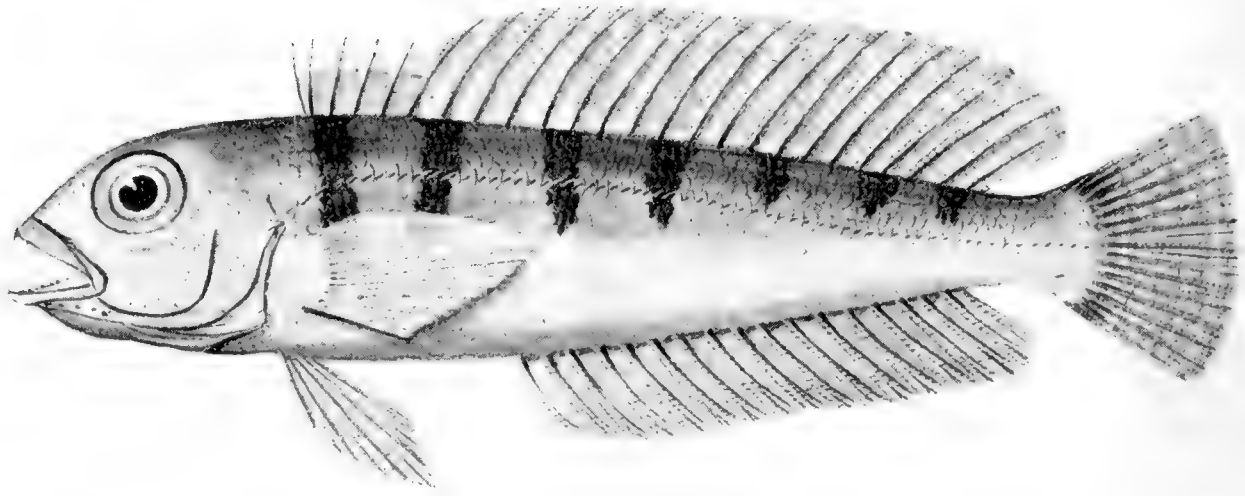


Fig. 218. *Neoopercis allporti.*

FAMILY URANOSCOPIDAE.

KATHETOSTOMA Günther, 1860 (laeve).

KATHETOSTOMA LAEVE Bloch & Schneider (Stone-lifter).

Uranoscopus laevis Bl. & Schn., Syst. Ichth., 1801, p. 47, pl. viii.

Kathetostoma laeve Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 231; Stead, Fish. Aust., 1906, p. 206, pl. viii; Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 471, pl. xiii, fig. 3 (head).

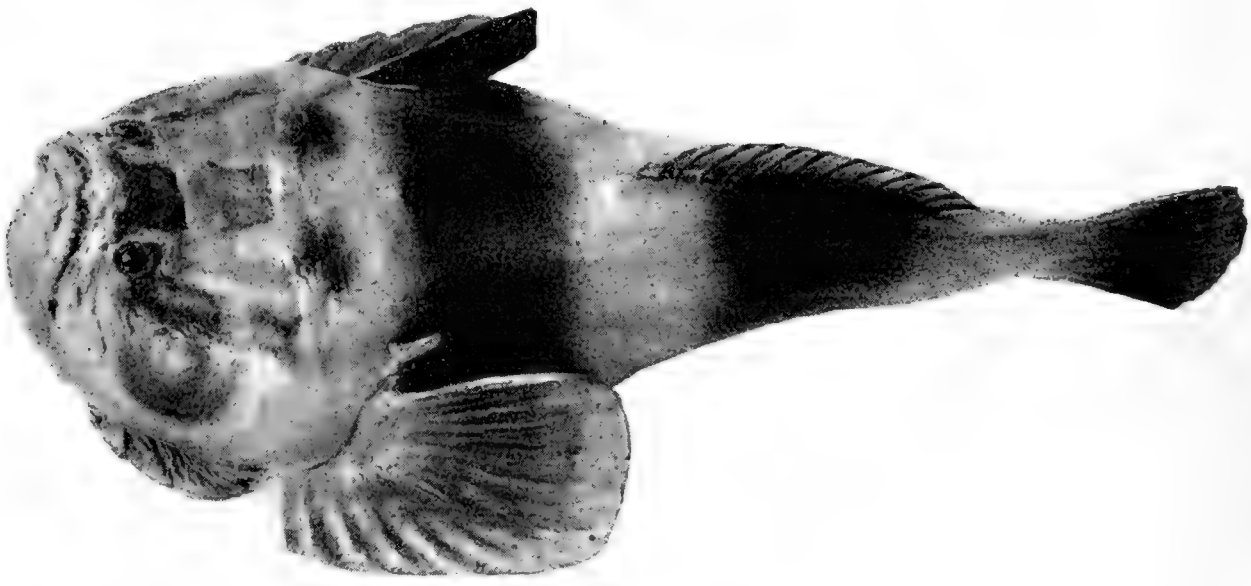


Fig. 219. *Kathetostoma laeve.*

The repulsive appearance of the Stone-lifters militates against their popularity as food.

KATHETOSTOMA NIGROFASCIATUM Waite & McCulloch (Banded Stone Lifter).

Kathetostoma nigrofasciatum Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 469, pl. xiii, fig. 1, 2.

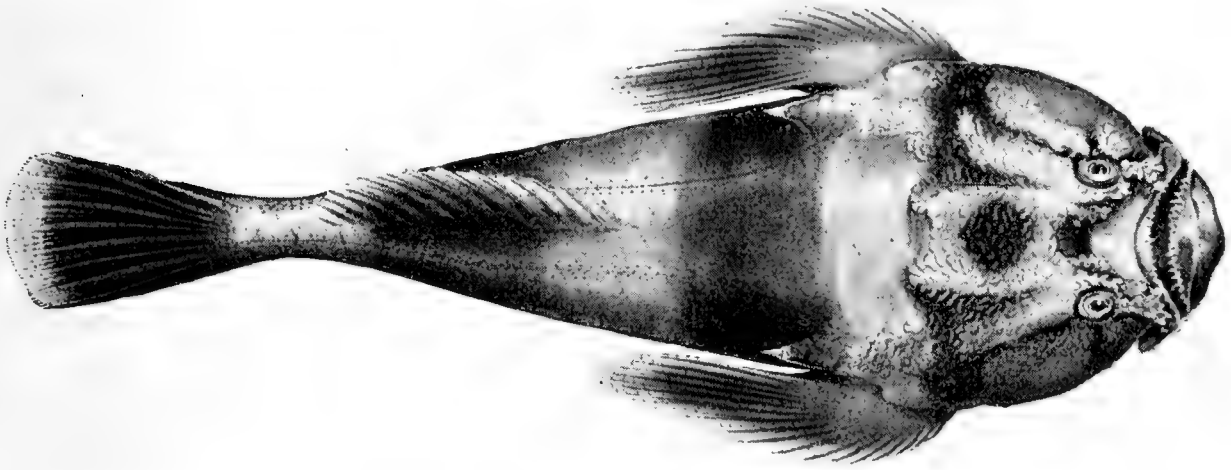


Fig. 220. *Kathetostoma nigrofasciatum.*

DIVISION NOTOTHENIIFORMES.

FAMILY BOVICHTHYIDAE.

PSEUDAPHRITIS Castelnau, 1872 (bassii=urvillii).

PSEUDAPHRITIS URVILLII Cuvier & Valenciennes (Congolli).

Aphritis urvillii Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 484, pl. ccxliii.
Pseudaphritis bassii Cast., P.Z.S., Vict., i, 1872, p. 92.
Aphritis bassi Ogil., Rec. Aust. Mus., i, 1890, p. 68.
Pseudaphritis urvillii Ogil., P.L.S., N.S.W., xxii, 1898, p. 560.

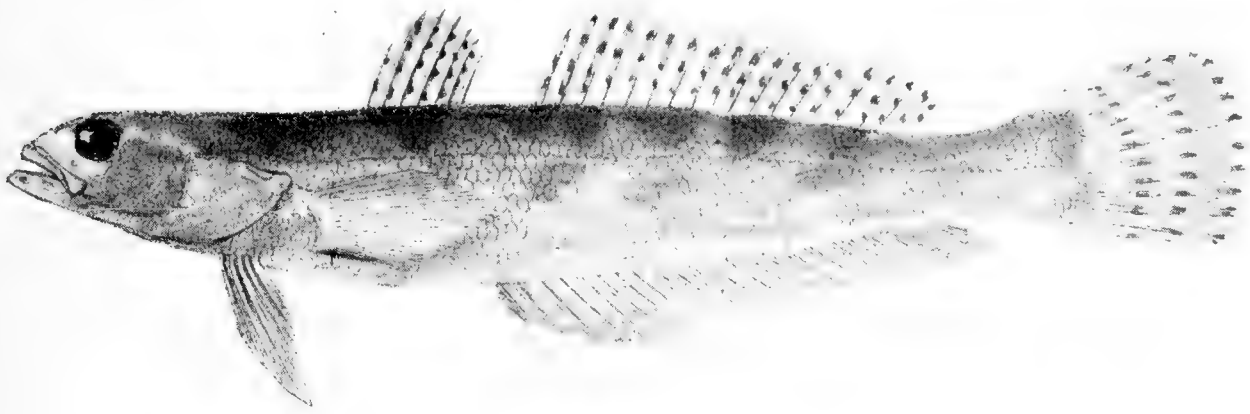


Fig. 221. *Pseudaphritis urvillii.*

Occurs in our estuarine rivers in both salt and fresh water. It reaches a length of 14 inches and is a fairly well-flavoured table fish.

BOVICHTHYS Cuvier & Valenciennes, 1831 (diacanthus).
(Originally written *Bovichtus*.)

BOVICHTHYS VARIEGATUS Richardson.

Bovichthys variegatus Rich., Zool. Ereb. & Terr., 1846, p. 56, pl. xxxiv, fig. 1-4.

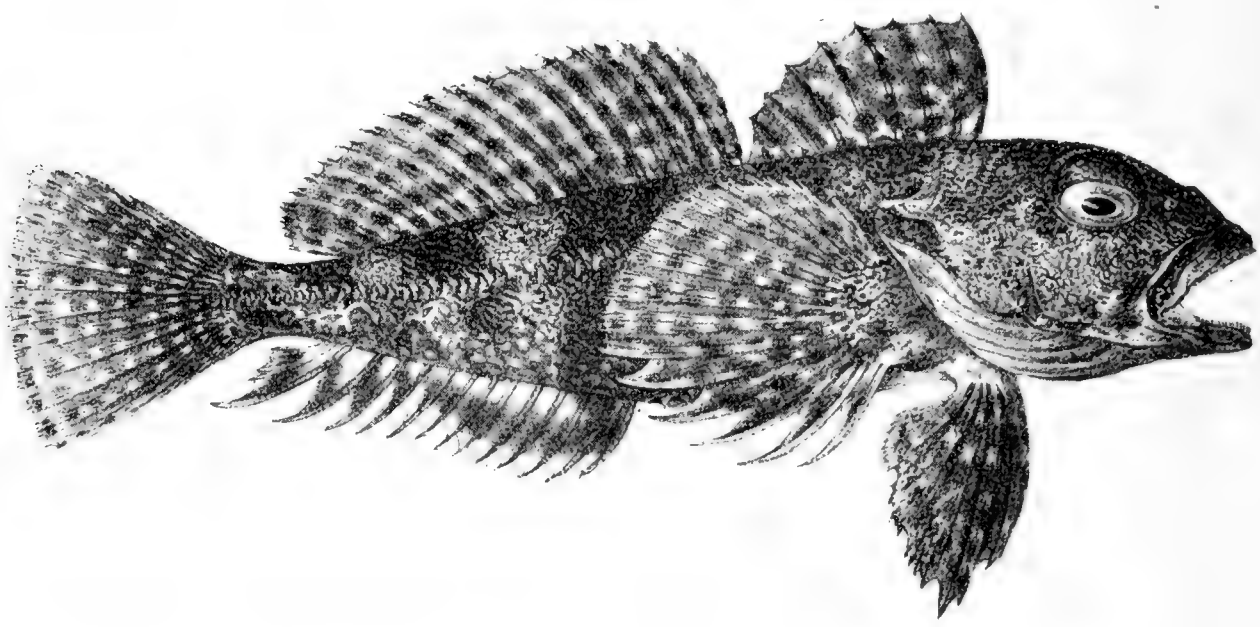


Fig. 222. *Bovichthys variegatus.*

DIVISION CALLIONYMIFORMES.

FAMILY CALLIONYMIDAE.

CALLIONYMUS Linnaeus, 1758 (lyra).

CALLIONYMUS CALAUROPOMUS Richardson (Stink-fish).

Callionymus calauropomus Rich., Zool. Ereb. & Terr., 1844, p. 10, pl. vii, fig. 4, 5; McCoy, Prod. Zool. Vict., dec. xx, 1890, pl. cxcii.

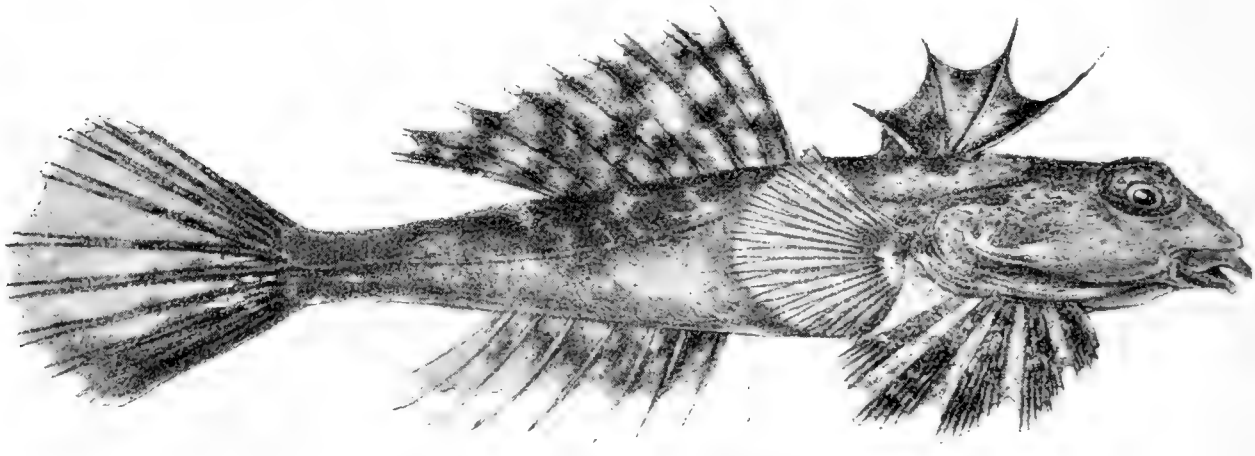


Fig. 223. *Callionymus calauropomus.*

SUB-ORDER SCOMBROIDEA.

FAMILY SCOMBRIDAE.

THUNNUS South, 1845 (thynnus).

THUNNUS THYNNUS Linnaeus (Tunny).

Scomber thynnus Linn., Syst. Nat. (ed. x), 1758, p. 297.
Scomber albacores Bonnat., Encycl. Ichth., 1788, p. 120.
Thynnus mediterraneus Risso, Eur. Merid., iii, 1826, p. 414.
Thynnus vulgaris, *T. brachypterus*, *T. coretta* and *Scomber sloanei* Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 58, 98, 102, 148, pl. ccx, ccxi.
Thynnus maccoyii Cast., P.Z.S., Viet., i, 1872, p. 104; Roughley, Fish. Aust., 1916, p. 164, pl. lvii.
Thynnus thynnus McCoy, Prod. Zool. Viet., dec. v, 1880, pl. xliv, fig. 2.
Orcynus schlegelii Steind. & Döder., Denk. Akad. Wiss. Wien, xlvii, 1884, p. 10, pl. iii, fig. 1.
Albacora thynnus Jord., Proc. Acad. Nat. Sci. Phila., 1888, p. 180.

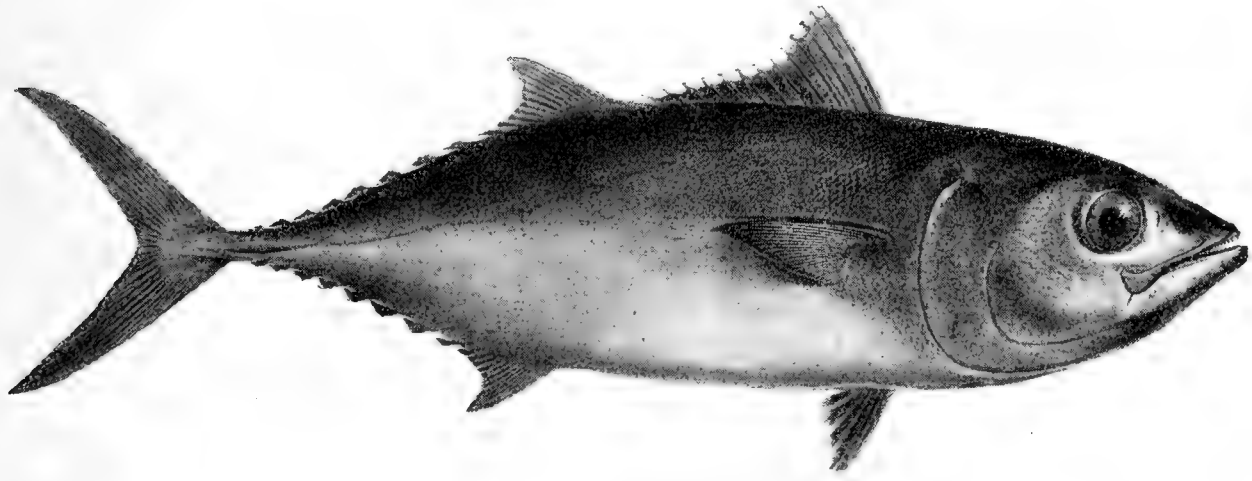


Fig. 224. *Thunnus thynnus.*

The famous Tuna of American anglers; reaches a weight of 1,500 lb. The flesh of large examples is very oily.

SCOMBER Linnaeus, 1758 (scombrus).

SCOMBER COLIAS Gmelin (Mackerel).

Scomber colias Gmel., Syst. Nat. (ed. xiii), 1789, p. 1329; Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 39, pl. ccix; Day, Fish. Gt. Brit. & Irel., i, 1881, p. 91, pl. xxxiv; Stead, Edib. Fish. N.S.W., 1908, p. 94, pl. lxiii; Roughley, Fish. Aust., 1916, p. 162, pl. lvi.

Scomber pneumatophorus De la Roche, Ann. Mus. Hist. Nat., xiii, 1809, p. 315, 334; McCoy, Prod. Zool. Viet., dec. iii, 1879, pl. xxviii; Ogil., Edib. Fish. N.S.W., 1893, p. 93.
Scomber australasicus Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 49.
Scomber antarcticus Cast., P.Z.S., Viet., i, 1872, p. 106.
Pneumatophorus pneumatophorus Jord. & Gilb., P.U.S. Nat. Mus., v, 1882, p. 593.

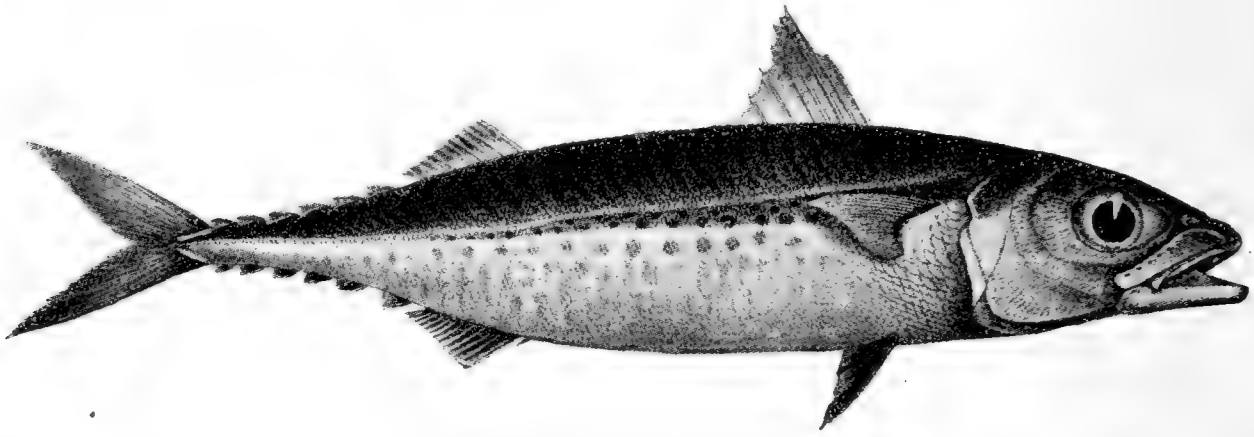


Fig. 225. *Scomber colias.*

The famous Blue-cod of New Zealand, which, in the writer's opinion, is the finest food-fish Australasia produces.

SUB-ORDER TRICHIUROIDEA.

FAMILY TRICHIURIDAE.

THYRSITES Cuvier, 1829 (atun).

THYRSITES ATUN Euphrasen (Barracouta).

Scomber atun Euphr., Vetensk. Acad. Nya Handl., xii, 1791, p. 315.
Thyrsites atun and *T. chilensis* Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 196, 204, pl. ccxix; Valenc., in Cuv., Règ. Anim., Ill. Poiss., 1839, pl. xlix, fig. 1; McCoy, Prod. Zool. Viet., dec. v, 1880, pl. xliv, fig. 1.
Thyrsites altivelis Rich., P.Z.S., 1839, p. 99.

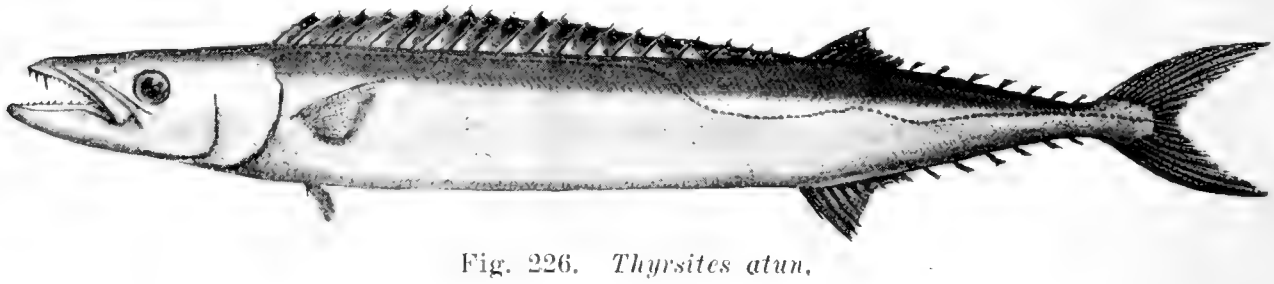


Fig. 226. *Thyrsites atun.*

The illustration is of a New Zealand specimen. Examples taken in our waters are generally infested with muscle worms and are much emaciated; in such condition they are spoken of as "axe-handles."

SUB-ORDER XIPHIOIDEA.

FAMILY XIPHIIDAE.

XIPHIAS Linnaeus, 1758 (gladius).

XIPHIAS GLADIUS Linnaeus (Swordfish).

Xiphias gladius Linn., Syst. Nat. (ed. x), 1758, p. 248; Cuv. & Val., Hist. Nat. Poiss., viii, 1831, p. 255, pl. ccxxv, ccxxvi; Valenc., in Cuv., Règ. Anim., Ill. Poiss., pl. l, lii; Day, Fish. Gt. Brit. & Irel., i, 1881, p. 146, pl. xlix.
Xiphias rondeletii Leach, Zool. Misc., i, 1814, p. 62, pl. xxvii and Mem. Wern. Nat. Hist. Soc., ii, 1818, p. 58, pl. ii, fig. 1.

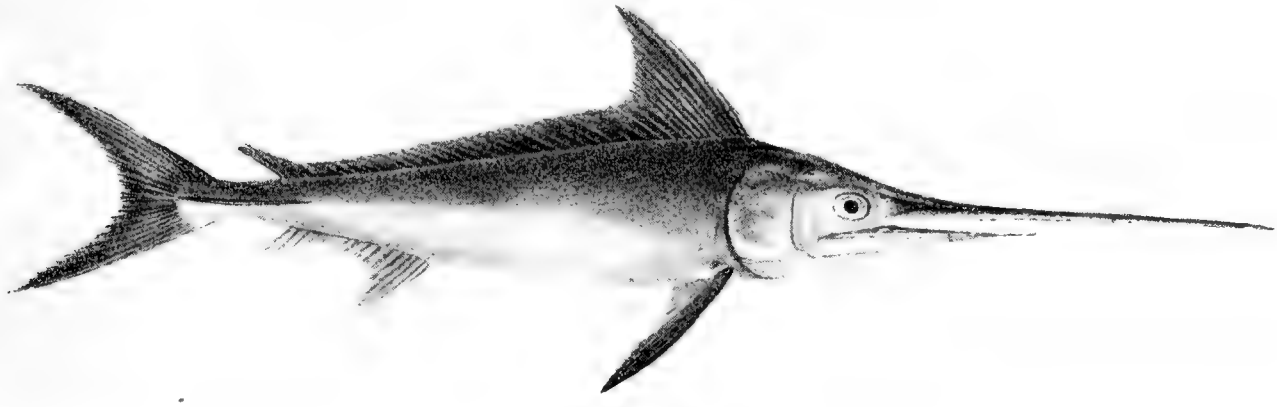


Fig. 227. *Xiphias gladius.*

The species is here determined from an imperfect skull, 4 ft. 2 in. in total length, found at Windsor, St. Vincent Gulf. The Museum possesses the sword of another example, taken at Port Augusta, Spencer Gulf; this specimen measured 14 feet in length; the species is said to attain to 15 feet. The extremely flattened sword is characteristic of this monotypic Family.

SUB-ORDER GOBIOIDEA.

FAMILY GOBIIDAE.

GOBIUS Linnaeus, 1758 (niger).

GOBIUS BIFRENATUS Kner (Bridled Goby, Tarkatuki).

Gobius bifrenatus Kner, Reise Novara, 1865, p. 177, pl. vii, fig. 3; Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 383; McCull. & Ogil., Rec. Aust. Mus., xii, 1919, p. 242.

Gobius bassensis Cast., P.Z.S., Vict., i, 1872, p. 123.

Gobius caudatus Cast., *op. cit.*, ii, 1873, p. 47.

?Gobius frenatus Zietz, T.R.S., S.A., xxvi, 1902, p. 267 (not Günth.).

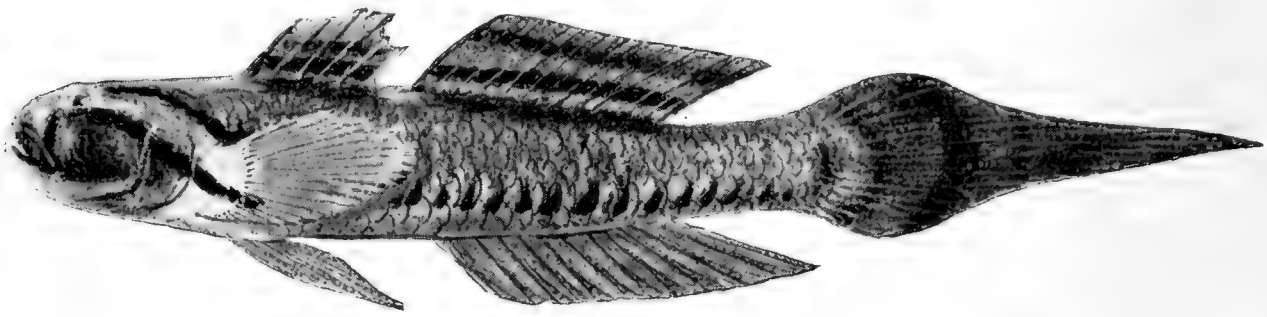


Fig. 228. *Gobius bifrenatus.*

All the Gobies are small fishes, economically used only as bait. Several species are kept in aquaria.

GOBIUS HINSBYI McCulloch & Ogilby.

Gobius pictus Cast., P.Z.S., Vict., i, 1872, p. 124 (not Malm.).

Gobius hinsbyi Johnston, P.R.S., Tasm., 1903, p. x (name only); McCull. & Ogil., Rec. Aust. Mus., xii, 1919, p. 215, pl. xxxiii, fig. 1.

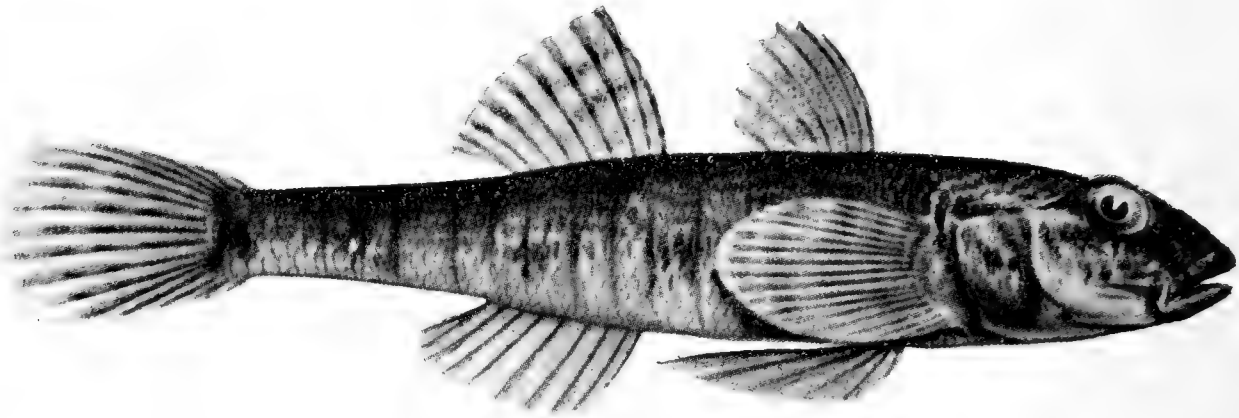


Fig. 229. *Gobius hinsbyi.*

GOBIUS LATERALIS Macleay.

Gobius lateralis Macl., P.L.S., N.S.W., v, 1881, p. 602.

Rhinogobius lateralis McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 48, pl. ii, fig. 3.

Rhinogobius lateralis var. *obliquus* McCull. & Ogil., Rec. Aust. Mus., xii, 1919, p. 249, pl. xxxiv, fig. 4.

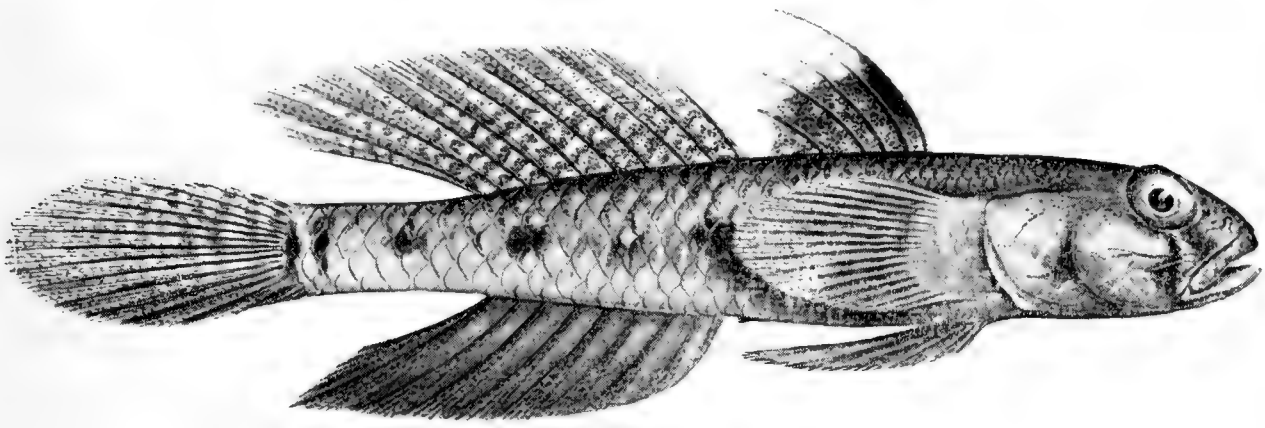


Fig. 230. *Gobius lateralis.*

GOBIUS HAACKEI Steindachner.

Gobius haackei Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 194 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1074.

GOBIUS FILAMENTOSUS Castelnau.

Gobius filamentosus Cast., Res. Fish. Aust., 1875, p. 19.

GOBIUS EREMIUS Zietz.

Gobius eremius Zietz, Rep. Horn. Exped., ii, 1896, p. 180, pl. xvi, fig. 5; McCull., Rec. Aust. Mus., xi, 1917, p. 183, pl. xxxi, fig. 1.

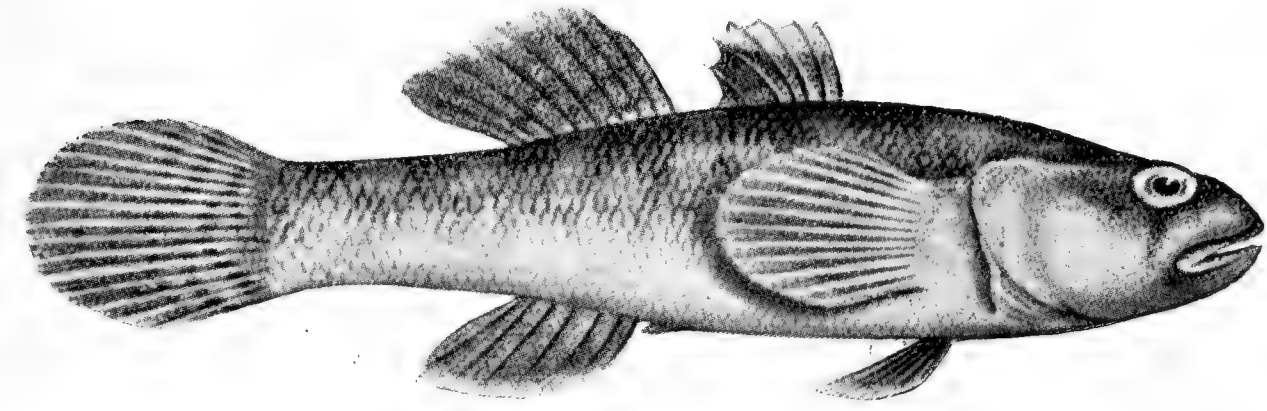


Fig. 233. *Gobius eremius.*

VALENCIENNEA Bleeker, 1868 (hasselti).

VALENCIENNEA HASSELTI Bleeker.

Elcotris hasselti Bleek., Nat. Tijds. Ned. Indie., i, 1851, p. 253.

South Australian specimens are referred to a variety as below.

var. MUCOSA Günther.

Gobius mucosus Günth., P.Z.S., 1871, p. 663, pl. lxiii, fig. A.
Gobius depressus Rams. & Ogil., P.L.S., N.S.W. (2), i, 1886, p. 4.
Mucogobius mucosus McCull., Rec. W. Aust. Mus., i, 1912, p. 93.
Callogobius hasseltii var. *mucosus* McCull. & Ogil., Rec. Aust. Mus., xii, 1919, p. 217, pl. xxxii, fig. 4.

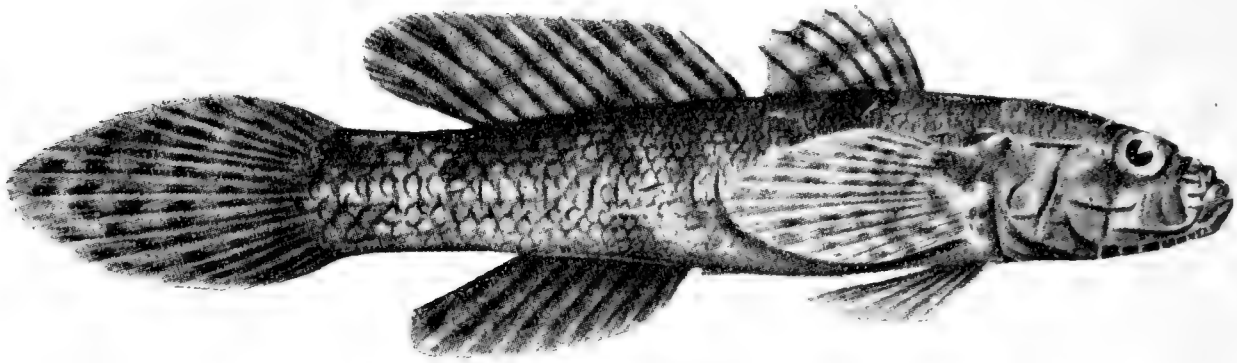


Fig. 234. *Valenciennea hasselti* var. *mucosa*.

MUGILOGOBIUS Smitt, 1899 (fontinalis).

MUGILOGOBIUS GALWAYI McCulloch & Waite (Blue-spot Goby).

Mugilogobius galwayi McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 50, pl. iii, fig. 1.

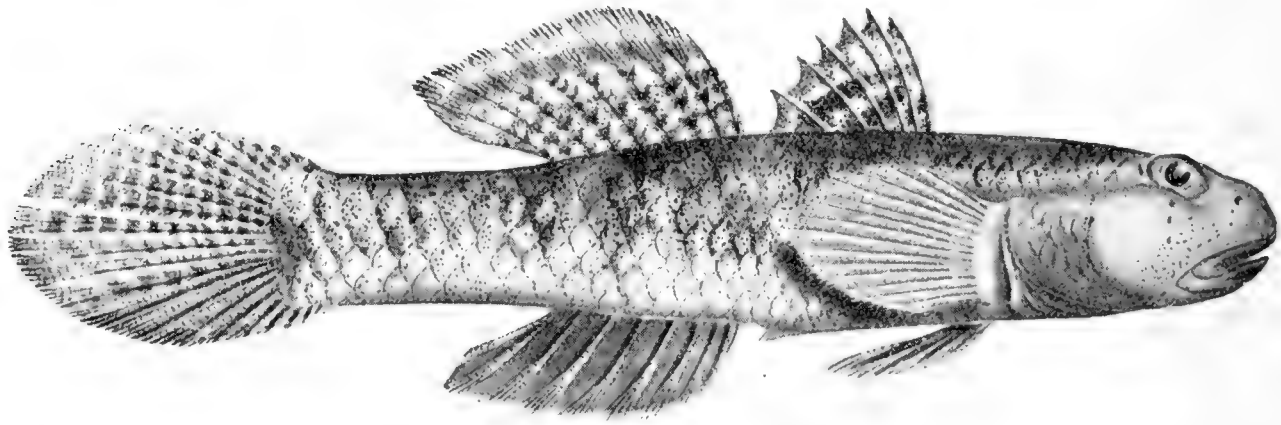


Fig. 235. *Mugilogobius galwayi*.

FAMILY ELEOTRIDAE.

MOGURNDA Gill, 1863 (mogurnda).

MOGURNDA ADSPERSA Castelnau (Chequered Gudgeon).

Eleotris mogurnda Bleek., Nederl. Tijdschr. Dierk., ii, 1865, p. 71 (not Rich.).
Eleotris adspersa Cast., P.L.S., N.S.W., iii, 1878, p. 142.
Eleotris mimus and *E. concolor* De Vis, P.L.S., N.S.W., ix, 1884, p. 690, 692.
Krefftius adspersus Ogil., P.L.S., N.S.W., xxii, 1898, p. 789; Waite, Rec. Aust. Mus., v, 1904, p. 282, pl. xxv, fig. 1.
Mogurnda mogurnda adspersus McCull & Ogil., Rec. Aust. Mus., xii, 1919, p. 282.

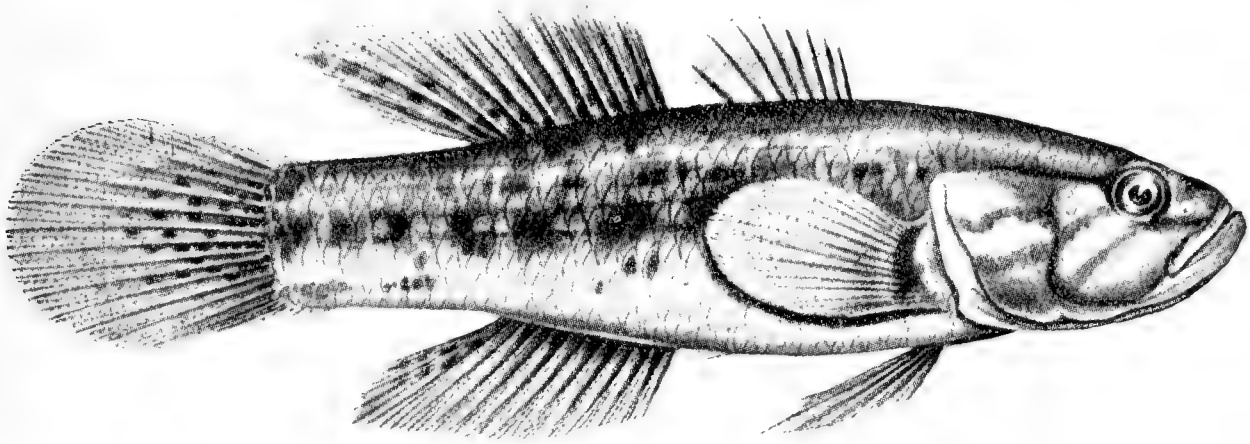


Fig. 236. *Mogurnda adspersa.*

A favourite aquarium fish, successfully introduced into America and there bred by fanciers.

PHILYPNODON Bleeker, 1874 (nudiceps=grandiceps?).

PHILYPNODON GRANDICEPS Krefft (Big-headed Gudgeon).

Eleotris grandiceps Krefft, P.Z.S., 1864, p. 183.
Eleotris gymnocephalus Steind., Sitzb. Akad. Wiss. Wien, liii, 1866, p. 453, pl. ii, fig. 3.
?Eleotris nudiceps Cast., P.Z.S., Viet., i, 1872, p. 126.
Gymnobutis gymnocephalus Bleek., Arch. Neerl. Sci. Nat., ix, 1874, p. 304.
Ophiorrhinus grandiceps Ogil., P.L.S., N.S.W., xxi, 1897, p. 746.
Ophiorrhinus angustifrons Ogil., *op. cit.*, xxii, 1898, p. 793.
Philypnodon grandiceps Waite, Rec. Aust. Mus., v, 1904, p. 285, pl. xxxvi, fig. 2.

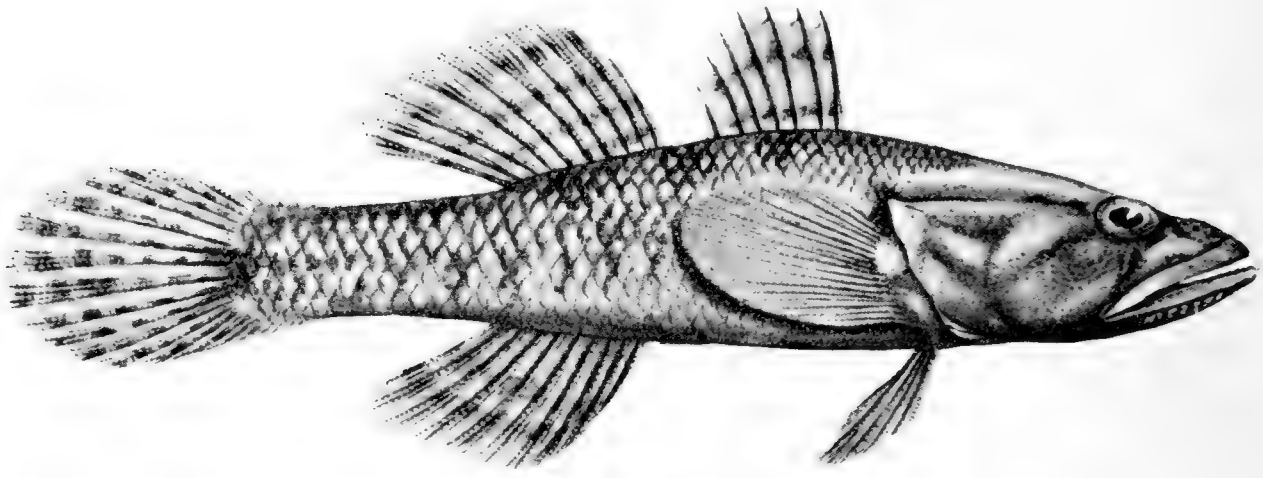


Fig. 237. *Philypnodon grandiceps.*

Not known from South Australia until this year (1921), when members of the S.A. Aquarium Society obtained examples in the River Murray billabongs.

SUB-ORDER BLENNIOIDEA.

FAMILY BLENNIIDAE.

BLENNIUS Linnaeus, 1758 (ocellaris).

BLENNIUS TASMANIANUS Richardson (Blenny).

Blennius tasmanianus Rich., P.Z.S., 1839, p. 99 and T.Z.S., iii, 1849, p. 129; Waite, Rec. Aust. Mus., vi, 1906, p. 205, pl. xxxvi, fig. 5.
Blennius victoriae Fowl., Proc. Acad. Nat. Sci. Phil., lix, 1907, p. 442, fig. 10.

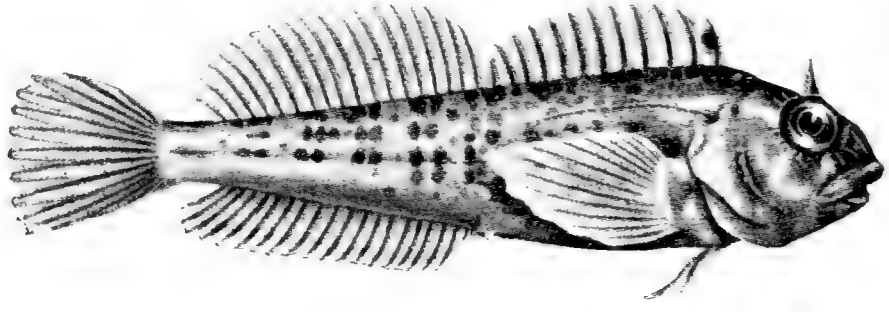


Fig. 238. *Blennius tasmanianus.*

All the Blennies are small and of no marketable value. The group is greatly in need of scientific revision.

NEOBLENNIUS Castelnau, 1875 (fasciatus).

NEOBLENNIUS FASCIATUS Castelnau (Banded Blenny).

Neoblennius fasciatus Cast., Res. Fish. Aust., 1875, p. 28.

PERONEDYS Steindachner, 1884 (anguillaris).

PERONEDYS ANGUILLARIS Steindachner.

Peronedys anguillaris Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 197 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1083; McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 60, pl. v, fig. 2.

Eucentronotus zietzi Ogil., P.L.S., N.S.W., xxiii, 1898, p. 294.

Fig. 240. *Peronedys anguillaris.*

HETEROCLINUS Castelnau, 1872 (adelaidae).

HETEROCLINUS ADELAIDAE Castelnau.

Heteroclinus adelaidae Cast., P.Z.S., Viet., i, 1872, p. 247.

OPHICLINUS Castelnau, 1872 (antarcticus).

OPHICLINUS ANTARCTICUS Castelnau.

Ophiclinus antarcticus Cast., P.Z.S., Viet., i, 1872, p. 246.

Neogunellus sulcatus Cast., Res. Fish. Aust., 1875, p. 27.

Ophiclinus sulcatus McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 55, fig. 28 (head).

OPHICLINUS GRACILIS Waite.

Ophioclinus gracilis Waite, Res. Aust. Mus., vi, 1906, p. 207, pl. xxxvi, fig. 6.

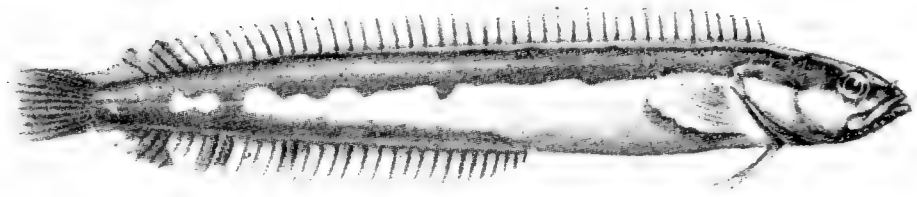


Fig. 243. *Ophiclinus gracilis.*

OPHICLINUS PARDALIS McCulloch & Waite.

Ophiclinus pardalis McCull & Waite, Rec. S. Aust. Mus., i, 1918, p. 58, pl. iv, fig. 2.

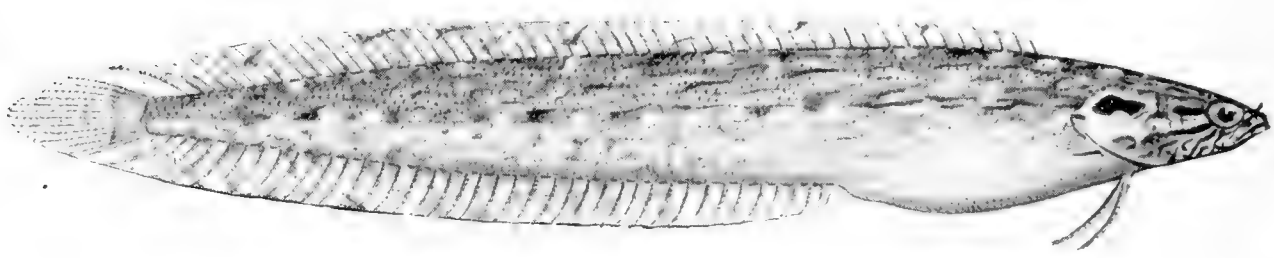


Fig. 244. *Ophiclinus pardalis.*

OPHICLINUS HOMACANTHUS Herzenstein.

Neogunellus homacanthus Herz., Ann. Mus. Zool., St. Petersb., i, 1896, p. 5.

OPHICLINUS MICROCHIRUS Herzenstein.

Neogunellus microchirus Herz., Ann. Mus. Zool., St. Petersb., i, 1896, p. 7.

CRISTICEPS Cuvier & Valenciennes, 1836 (australis).

CRISTICEPS AUSTRALIS Cuvier & Valenciennes (Weed Fish).

Cristiceps australis Cuv. & Val., Hist. Nat. Poiss., xi, 1836, p. 402, pl. cccxxxvi; Lucas, P.R.S., Viet. (n.s.), iii, 1891, p. 10, pl. iii, fig. 3; McCull., Rec. Aust. Mus., vii, 1908, p. 39, pl. x, fig. 3.

Christiceps splendens Cast., P.Z.S., Viet., i, 1872, p. 244 and ii, 1873, p. 66.

Cristiceps howittii Cast., P.Z.S., Viet., ii, 1873, p. 48, 66.

Cristiceps macleayi Cast., P.L.S., N.S.W., iii, 1879, p. 385.

Cristiceps pallidus Macl., P.L.S., N.S.W., vi, 1881, p. 26.

Fig. 247. *Cristiceps australis.*

CRISTICEPS TRISTIS Klunzinger.

Cristiceps tristis Klunz., Arch. f. Naturg., xxxviii, 1872, p. 31.

CLINUS Cuvier, 1817 (superciliosus).

CLINUS PERSPICILLATUS Cuvier & Valenciennes.

Clinus perspicillatus Cuv. & Val., Hist. Nat. Poiss., xi, 1836, p. 372; McCull., Rec. Aust. Mus., vii, 1908, p. 43, pl. xi, fig. 4.

Clinus despicillatus Rich., Zool. Journ., 1839, p. 90 and T.Z.S., iii, 1849, p. 128, pl. vi, fig. 2.

Fig. 249. *Clinus perspicillatus.*

LEPIDOBLENNIUS Steindachner, 1867 (haplodactylus).

LEPIDOBLENNIUS MARMORATUS Macleay.

Tripterygium marmoratum Macl., P.L.S., N.S.W., iii, 1878, p. 34, pl. iii, fig. 2.

Lepidoblennius marmoratus McCull. & McNeill, Rec. Aust. Mus., xii, 1918, p. 24; McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 62, pl. v, fig. 3.

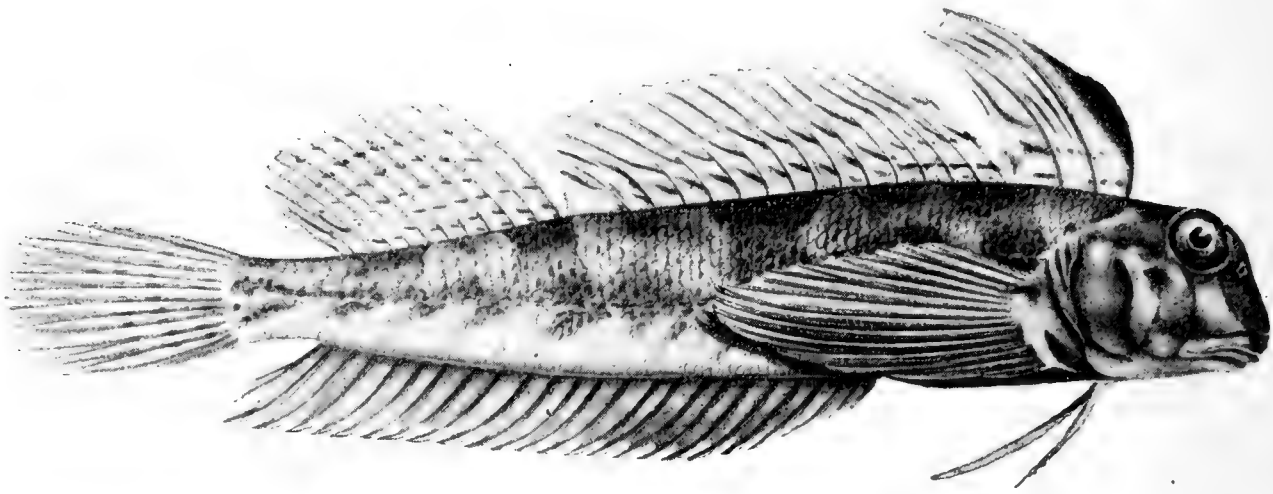


Fig. 250. *Lepidoblennius marmoratus.*

HELCOGRAMMA McCulloch & Waite, 1918 (decurrens).

HELCOGRAMMA DECURRENS McCulloch & Waite.

Helcogramma decurrens McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 52, pl. iii, fig. 2.

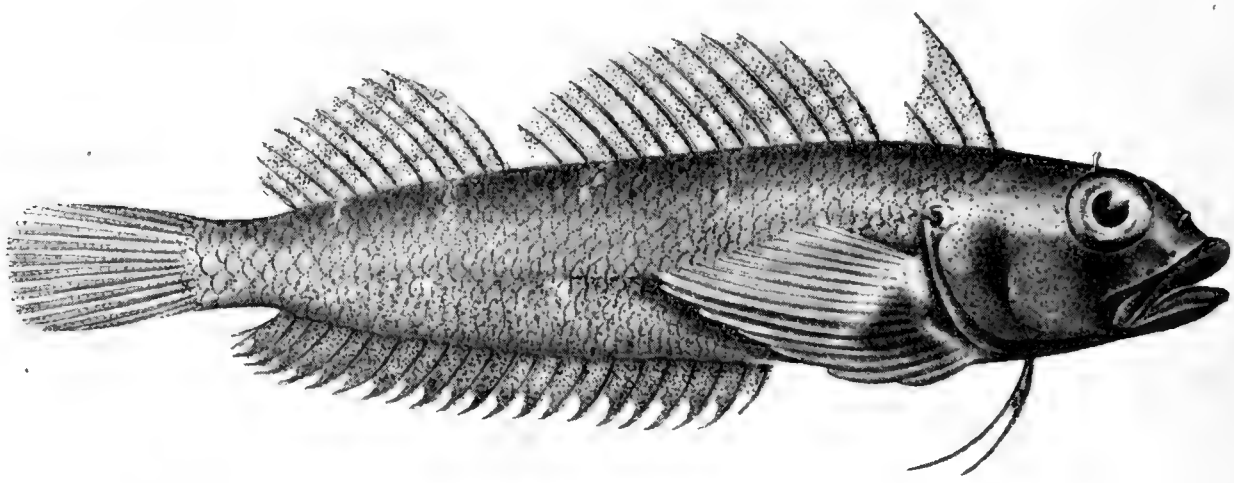


Fig. 251. *Helcogramma decurrens.*

TRIANECTES McCulloch & Waite, 1918 (bucephalus).

TRIANECTES BUCEPHALUS McCulloch & Waite.

Trianectes bucephalus McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 53, pl. iii, fig. 3.

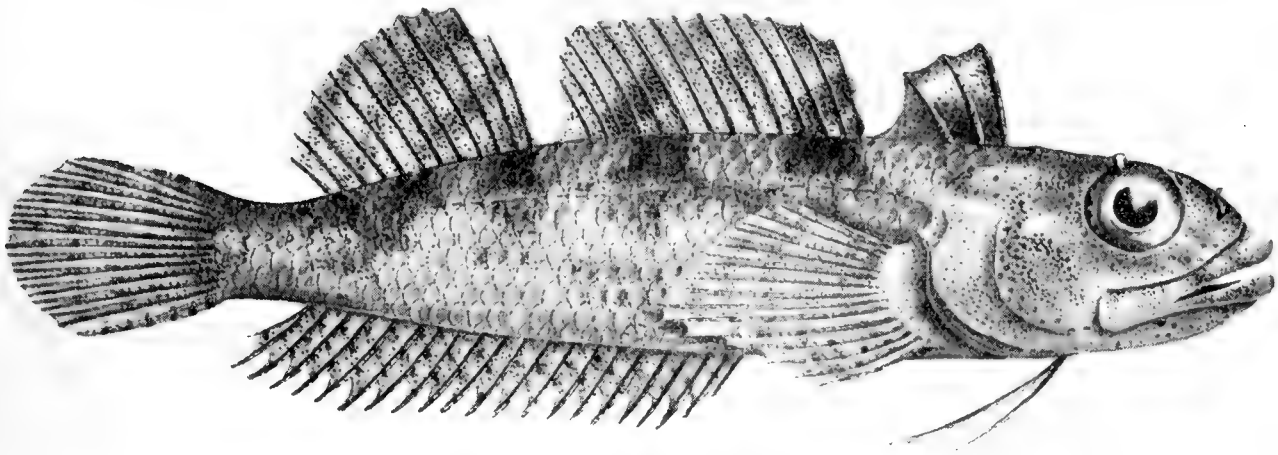


Fig. 252. *Triacectes bucephalus.*

FAMILY BROTULIDAE.

DERMATOPSIS Ogilby, 1896 (macrodon).

DERMATOPSIS MULTIRADIATUS McCulloch & Waite.

Dermatopsis multiradiatus McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 63, pl. v, fig. 4.

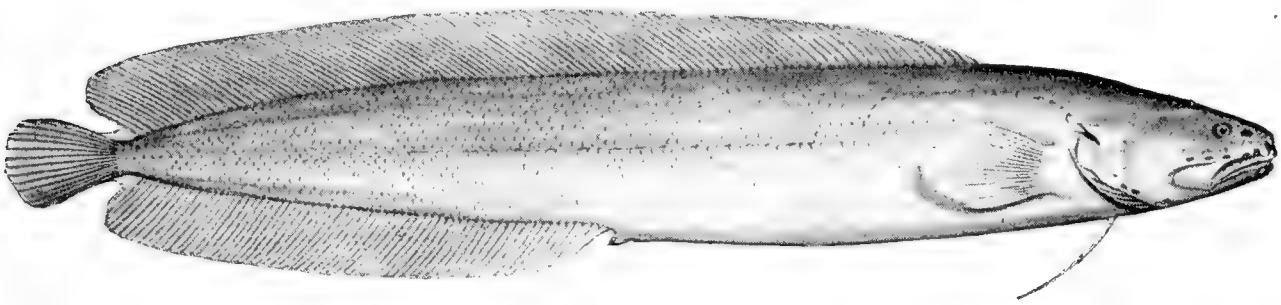


Fig. 253. *Dermatopsis multiradiatus.*

FAMILY OPHIDIIDAE.

GENYPTERUS Phillipi, 1857 (nigricans).

GENYPTERUS BLACODES Bloch & Schneider (Rockling).

Ophidium blacodes Bl. & Schn., Syst. Ichth., 1801, p. 484.

Genypterus blacodes Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 379 (part); Stead, Edib. Fish. N.S.W., 1908, p. 117, pl. lxxxi.

Genypterus tigerinus Klunz., Arch. f. Naturg., xxxviii, 1872, p. 39.

Genypterus australis Cast., P.Z.S., Vict., i, 1872, p. 164; McCoy, Prod. Zool. Vict., dec. iii, 1879, pl. xxvii, fig. 1.

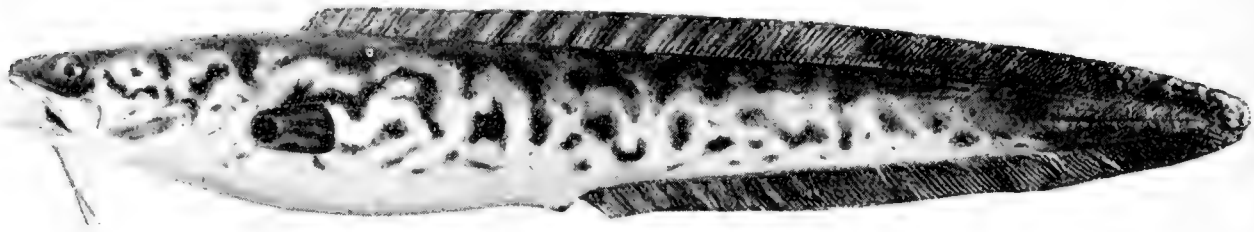


Fig. 254. *Genypterus blacodes.*

Neither of the two described species is brought to our markets in payable quantity.

GENYPTERUS MICROSTOMUS Regan.

Genypterus microstomus Regan, A.M.N.H. (7), xi, 1903, p. 599; McCull., Endeavour Res., ii, 1914, p. 159, pl. xiv, fig. 2.

Fig. 255. *Genypterus microstomus.*

ORDER HETEROSOMATA.

FAMILY BOTHIDAE.

LOPHONECTES Günther, 1880 (gallus).

LOPHONECTES GALLUS Günther (Crested Flounder).

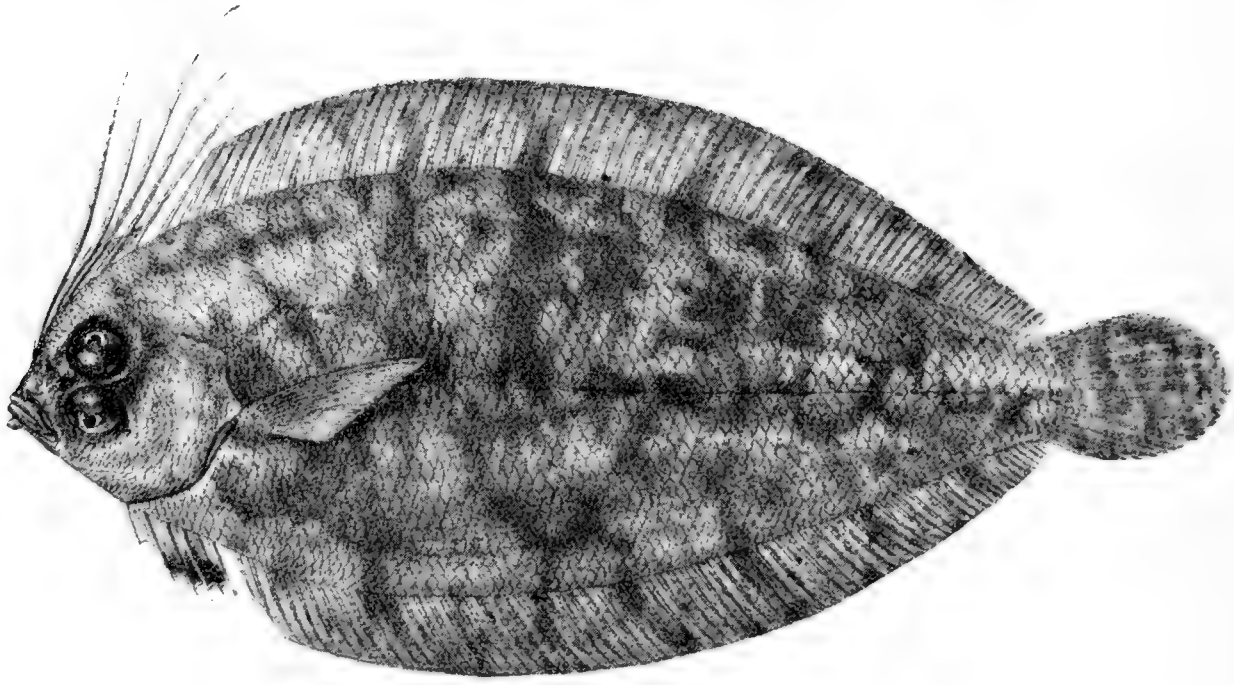


Fig. 256. *Lophonectes gallus.*

Lophonectes gallus Günth., Chall. Rep., i, 1880, p. 29, pl. xv, fig. B (reversed).
Lophorhombus cristatus Macl., P.L.S., N.S.W., vii, 1882, p. 14.

Though esteemed, as everywhere, flat-fishes are far from common in our markets and always command high prices. Scientifically, the Order needs revision.

FAMILY PLEURONECTIDAE.

RHOMBOSOLEA Günther, 1862 (monopus=plebeia).

RHOMBOSOLEA PLEBEIA Richardson (Flounder).

Rhombus plebeius Rich., in Dieffenbach, ii, 1843, p. 222.
Rhombosolea monopus Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 459.
Rhombosolea plebeia Gill, Mem. Nat. Acad. Sci., vi, 1893, p. 121; Waite, Rec. Cant. Mus., i, 1911, p. 203, pl. xxxv.

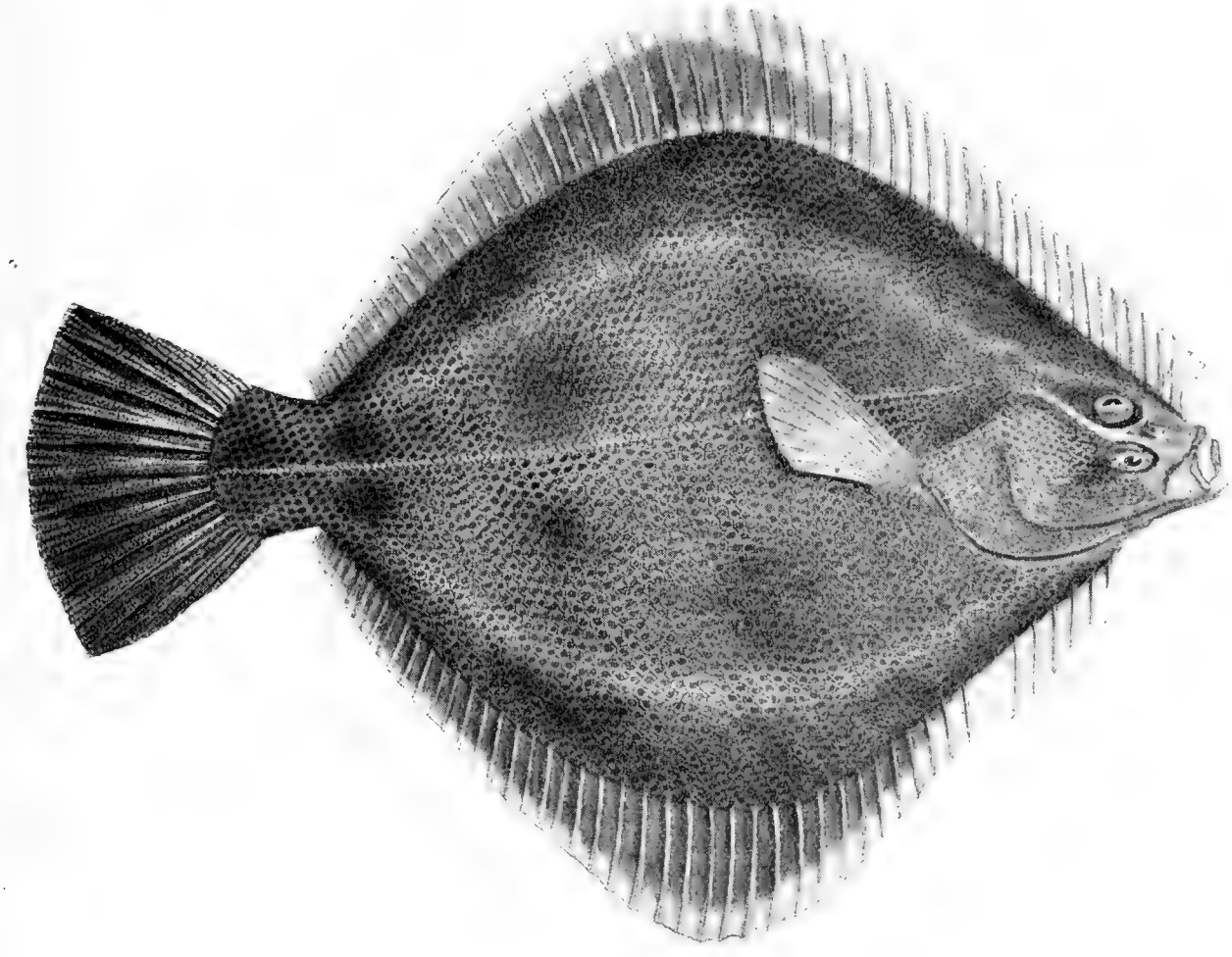


Fig. 257. *Rhombosolea plebeia.*

RHOMBOSOLEA VICTORIAE (Melbourne Flounder).

Pleuronectes? victoriae Cast., P.Z.S., Vict., i, 1872, p. 168.

AMMOTRETIS Günther, 1862 (rostratus).

AMMOTRETIS ROSTRATUS Günther (Long-snouted Flounder).

Ammotretis rostratus Günth., Cat. Fish. Brit. Mus., iv, 1862, p. 458; Stead, Edib. Fish. N.S.W., 1908, p. 103, pl. lxx.
Ammotretis adspersus Kner, Reise Novara, Fisch., 1868, p. 286, pl. xiii, fig. 4.
Rhombosolea bassensis Cast., P.Z.S., Vict., i, 1872, p. 167.
Ammotretis zonatus Macl., P.L.S., N.S.W., vii, 1882, p. 367.
Ammotretis macleayi Ogil., P.L.S., N.S.W., x, 1885, p. 121, 122.
Peltorhamphus bassensis Waite, Rec. Aust. Mus., vi, 1906, p. 198, pl. xxxiv.

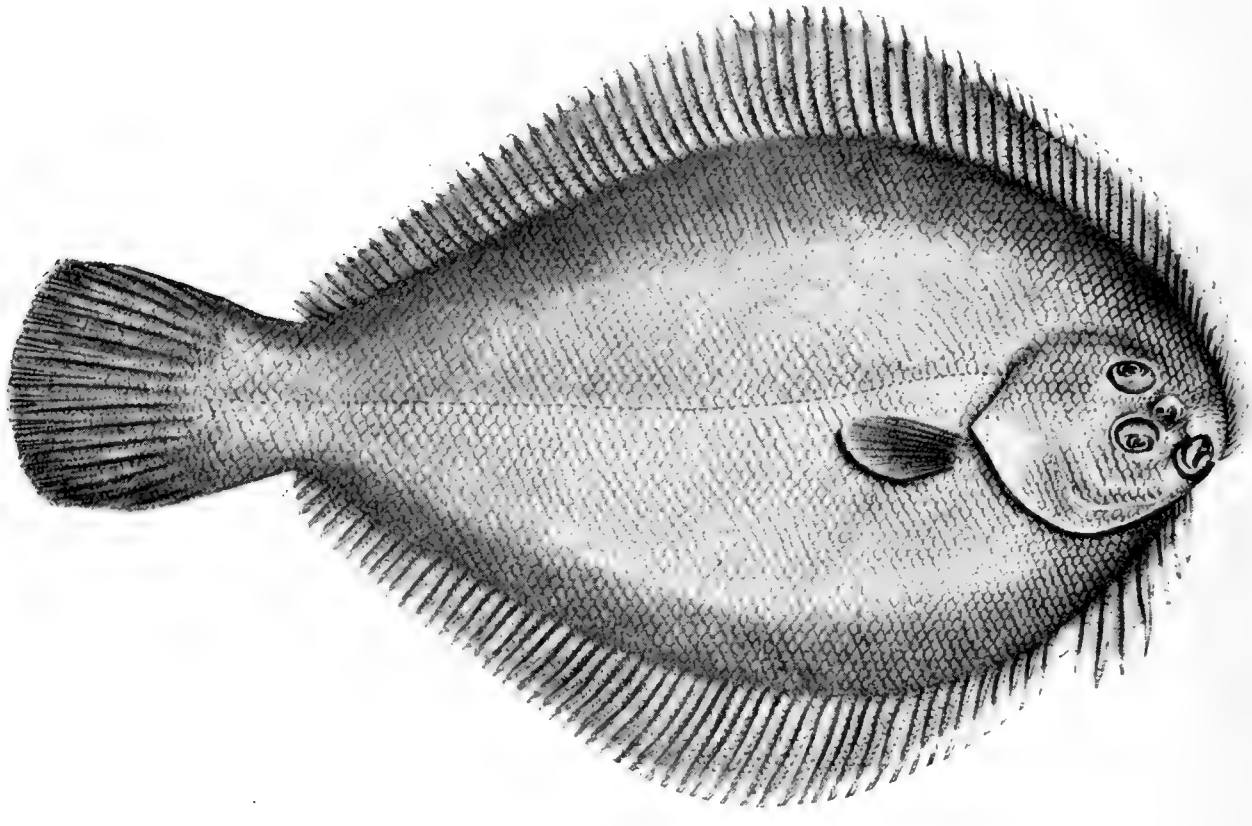


Fig. 259. *Ammotretis rostratus.*

AMMOTRETIS ELONGATUS McCulloch.

Ammotretis elongatus McCull., Endeavour Res., ii, 1914, p. 123, pl. xxvii.

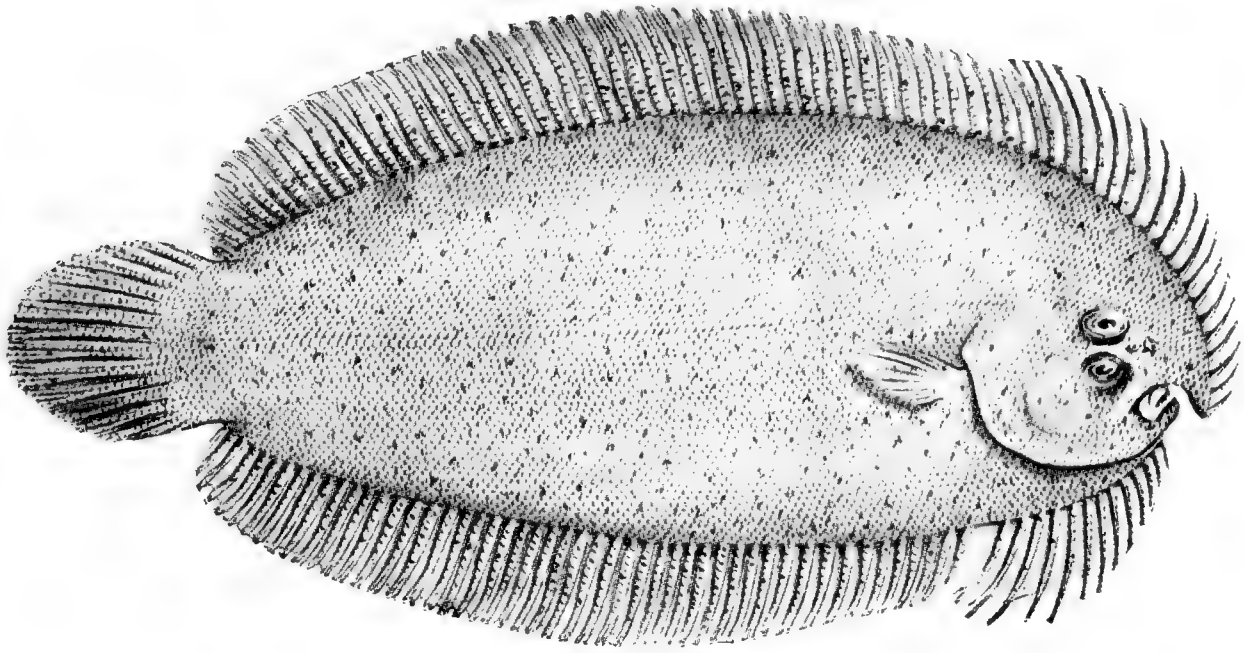


Fig. 260. *Ammotretis elongatus.*

AMMOTRETIS TUDORI McCulloch.

Ammotretis tudori McCull., Endeavour Res., ii, 1914, p. 124, pl. xxvi.

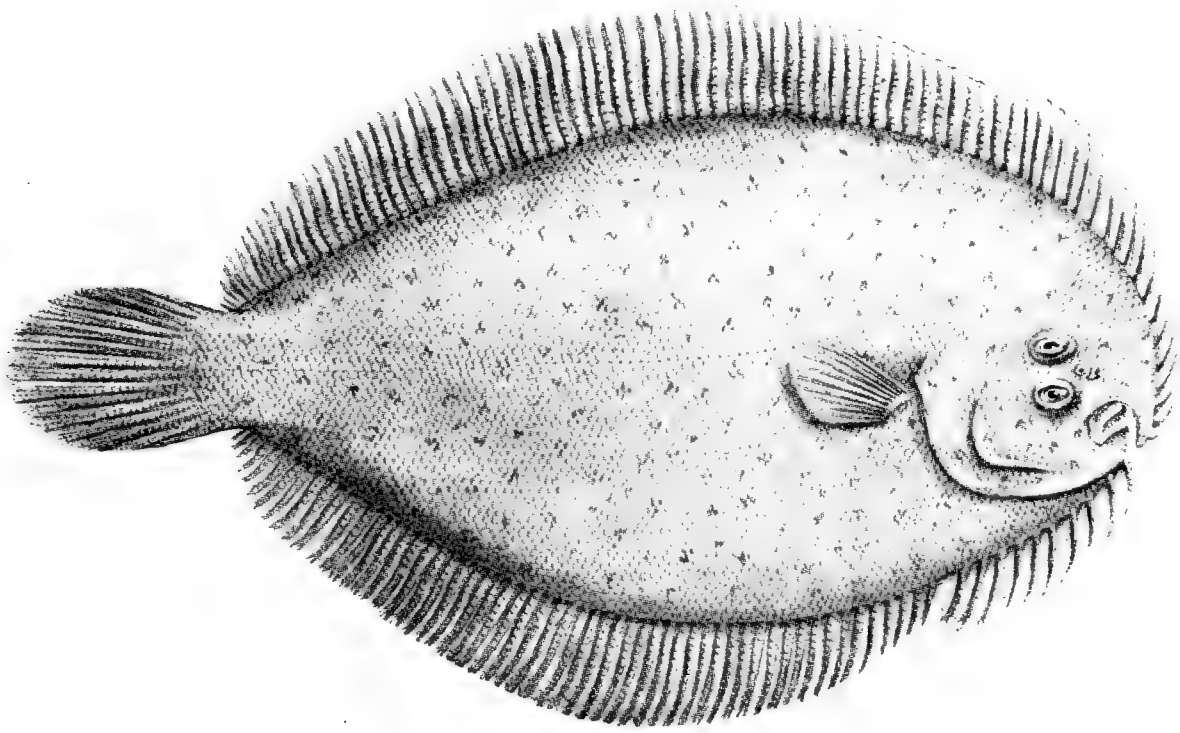


Fig. 261. *Ammotretis tudori.*

FAMILY SOLEIDAE.

ASERAGGODES Kaup, 1858 (guttulatus).

ASERAGGODES HAACKEANA Steindachner (Sole).

Solea (Achirus) haackeana Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 195 and Sitzb. Akad Wiss. Wien, lxxxviii, 1884, p. 1104, pl. i, fig. 3.

Solea (Aseraggodes) textilis Rams. & Ogil., P.L.S., N.S.W. (2), i, 1886, p. 6.

Aseraggodes haackeana McCull., Mem. Qld. Mus., v, 1916, p. 59.

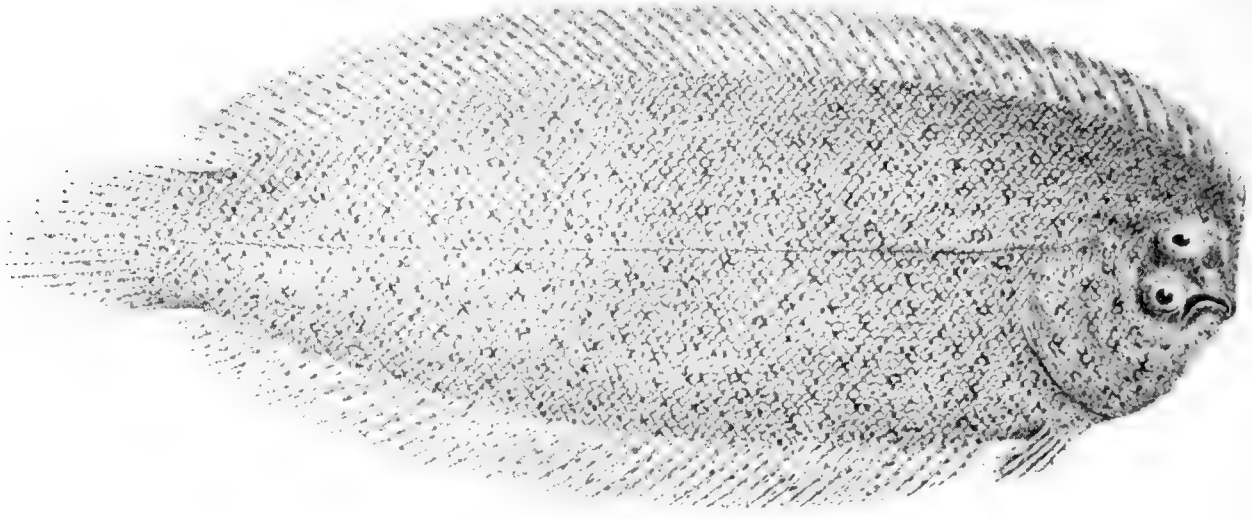


Fig. 262. *Aseraggodes haackeana.*

ORDER DISCOCEPHALI.

FAMILY ECHENEIDIDAE.

ECHENEIS Linnaeus, 1758 (naucrates).

ECHENEIS AUSTRALIS Bennett (Sucker Fish).

Echeneis australis Benn., Narr. Whaling Voy., ii, 1840, p. 273; Waite, T.R.S., S.A., xxxix, 1915, p. 340, pl. xi (disk).

Echeneis scutata Günth., A.M.N.H. (3), v, 1860, p. 401, pl. x, fig. B.

Remilegia australis Gill, Proc. Acad. Nat. Sci. Phil., 1864, p. 61.

Fig. 263. *Echeneis australis.*

The only example recorded from our waters accompanied a Norwegian vessel into dock, probably from the Indian Ocean.

Sucker fishes attach themselves to ships, whales, sharks, and other fishes by means of the sucking disk on the top of the head.

ECHENEIS REMORA Linnaeus (Remora).

Echeneis remora Linn., Syst. Nat. (ed. x), 1758, p. 260; Day, Fish. Gt. Brit. and Irel., i, 1881, p. 108, pl. xxxix, fig. 2.

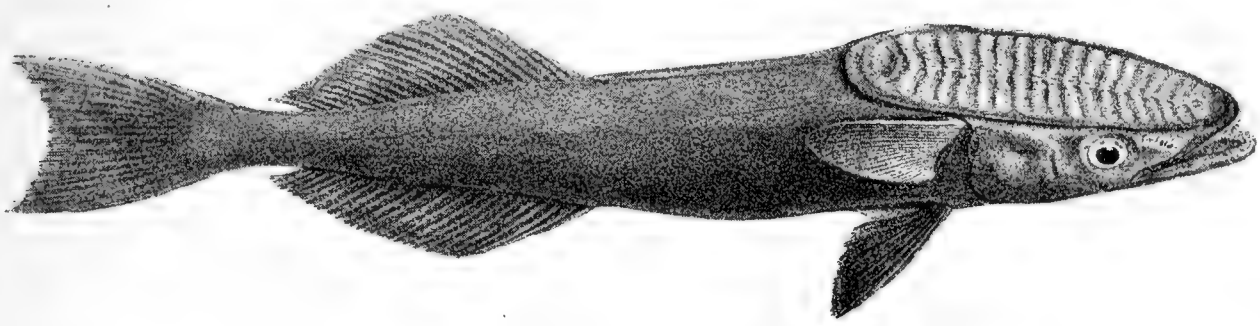


Fig. 264. *Echeneis remora.*

Under the title "The Myth of the Ship-holder," Mr. E. W. Gudger (18) has brought together the legends of the habits attributed to this curious fish.

ORDER SCLEROPAREI.

FAMILY SCORPAENIDAE.

SCORPAENA Linnaeus, 1758 (porcus).

SCORPAENA CRUENTA Richardson (Red Rock-cod).

Scorpaena cruenta Rich., A.M.N.H., ix, 1842, p. 217; Ogil., Edib. Fish. N.S.W., 1893, p. 63, pl. xx; Stead, Fish. Aust., 1906, p. 193, pl. vii and Edib. Fish. N.S.W., 1908, p. 108, pl. lxxv.

Scorpaena ergastulorum Rich., *loc. cit.*

Scorpaena militaris Rich., Zool. Ereb. & Terr., 1845, p. 22, pl. xiv, fig. 1, 2.

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(18) Gudger, Ann. Mag. Nat. Hist. (9), ii, 1918, p. 271, pl. xv-xvii and fig. 10 and iv, 1919, p. 17.

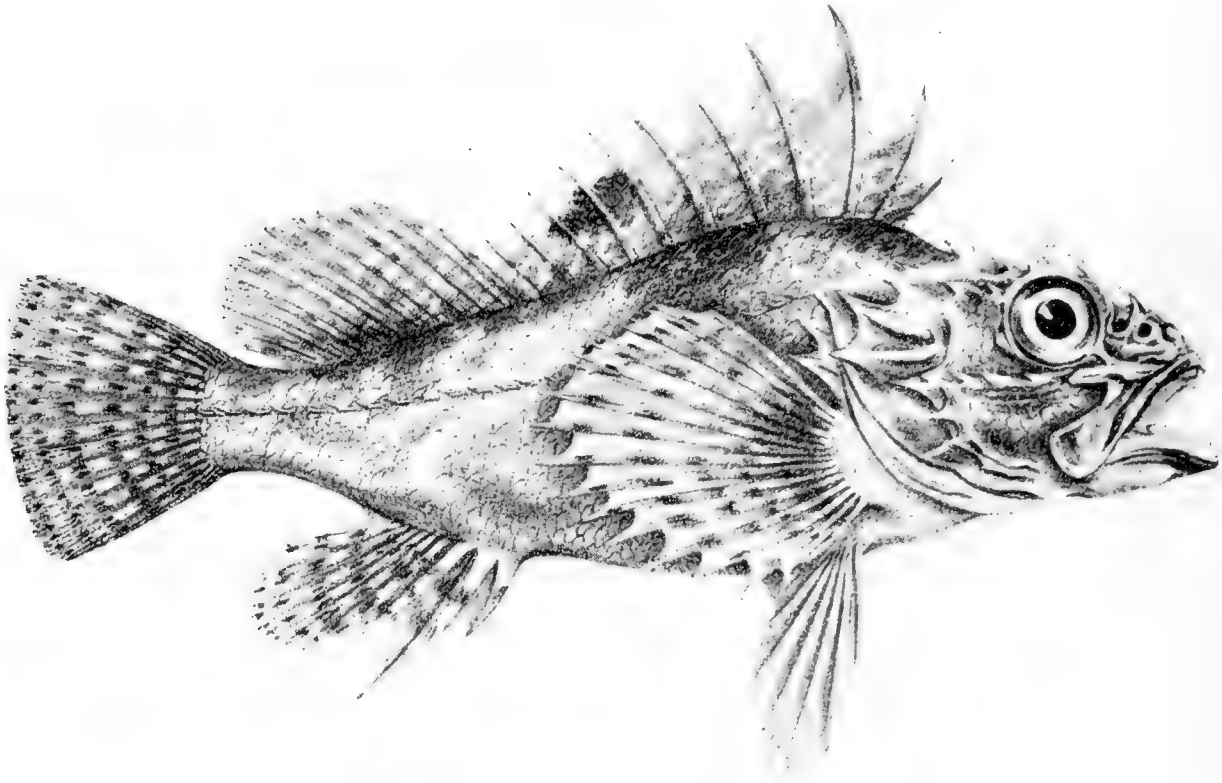

Fig. 265. *Scorpaena cruenta.*

Well known to rock anglers, its capacious mouth accommodating very large baits. The flesh is white and tender.

HELICOLENUS Goode & Bean, 1895 (dactylopterus).

HELICOLENUS PERCOIDES Richardson (Red Gurnard-perch).

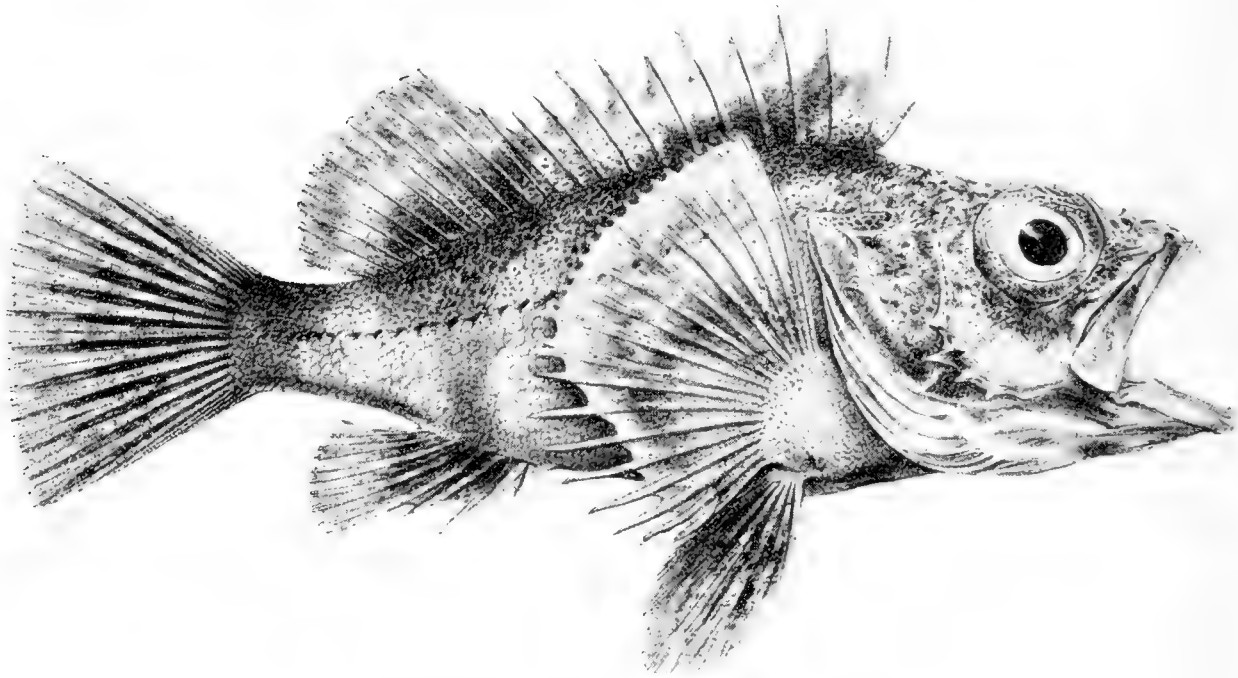

Fig. 266. *Helicolenus percoides.*

Sebastes percoides Rich., A.M.N.H., ix, 1842, p. 384 and Zool. Ereb. & Terr., 1845, p. 23, pl. xv, fig. 1, 2; McCoy, Prod. Zool. Vict., dec. iv, 1879, pl. xxxiii; Ten. Woods, Fish., N.S.W., 1883, pl. xiv; Ogil., Edib. Fish. N.S.W., 1893, p. 61.

Sebastes alporti Cast., P.Z.S., Vict., ii, 1873, p. 40.

Scorpaena barathri Hect., T.N.Z.I., vii, 1875, p. 245, pl. x, fig. 15a.

Sebastapistes percoides Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 46.

Helicolenus percoides McCull., Rec. Aust. Mus., vi, 1907, p. 350.

A fair food fish, but not regarded as equal to the preceding species.

NEOSEBASTES Guichenot, 1867 (scorpaenoides).

NEOSEBASTES SCORPAENOIDES Guichenot (Gurnard-perch).

Neosebastes scorpaenoides Guich., Mem. Soc. Sci. Cherbourg, xiii, 1867, p. 85; McCoy, Prod. Zool. Vict., dec. xx, 1890, pl. cxciii.

Sebastes scorpaenoides Klunz., Sitzb. Akad. Wiss. Wien, lxxx, 1880, p. 365, pl. v, fig. 1 (head).

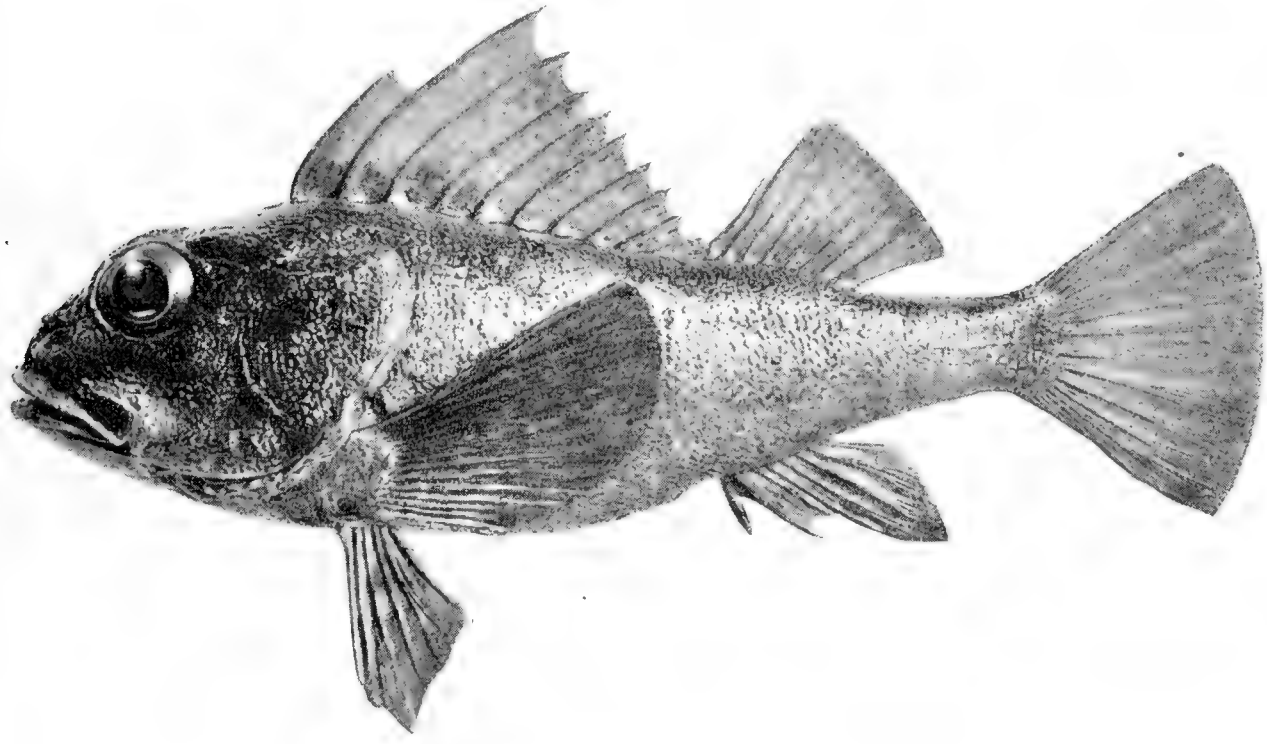

Fig. 267 *Neosebastes scorpaenoides.*

A winter market fish.

NEOSEBASTES PANDUS Richardson (Gurnard-perch).

Scorpaena panda Rich., A.M.N.H., ix, 1842, p. 216.
Sebastes pandus Rich., Zool. Ereb. & Terr., 1846, p. 70, pl. xli, fig. 3, 4.
Neosebastes panda Guich., Mem. Soc. Sci. Cherbourg, xiii, 1867, p. (86?).

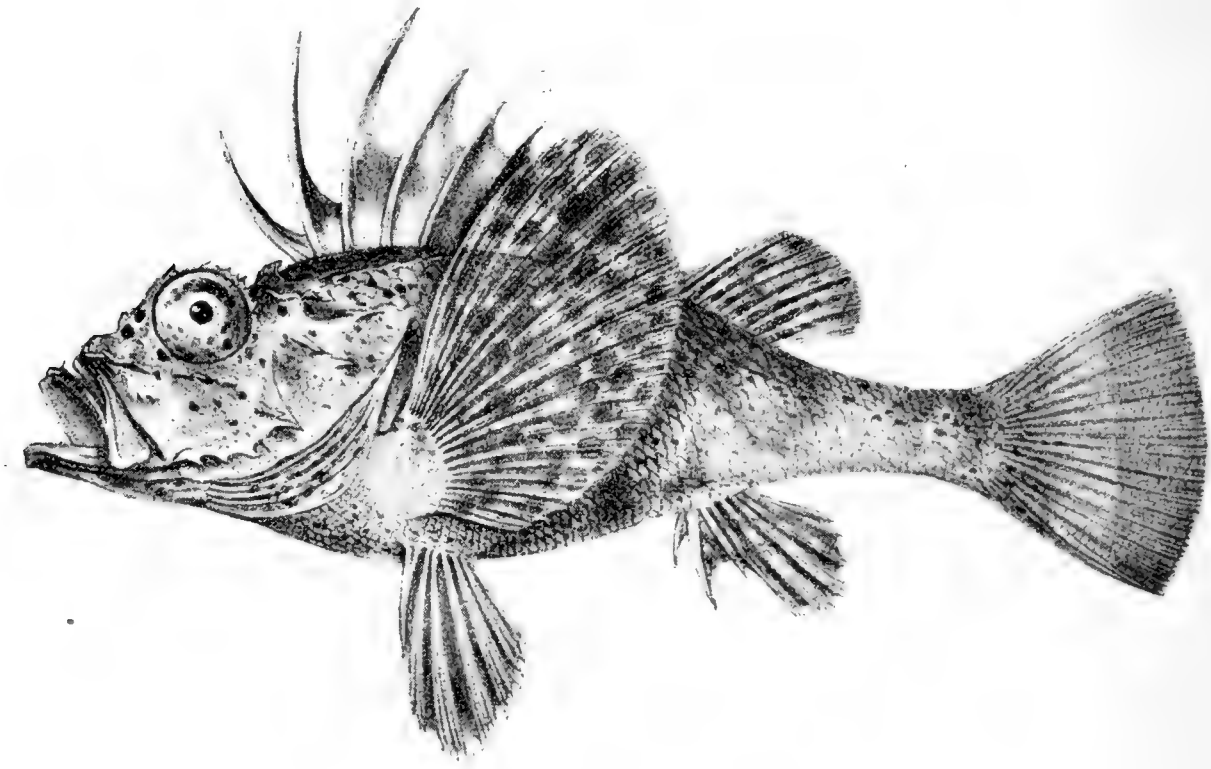

Fig. 268. *Neosebastes pandus.*

Not so well known here as in Victoria, where it is a common market fish.

NEOSEBASTES NIGROPUNCTATUS McCulloch (Black-spotted Gurnard-perch).

Neosebastes nigropunctatus McCull., Endeavour Res., iii, 1915, p. 157, pl. xxx.

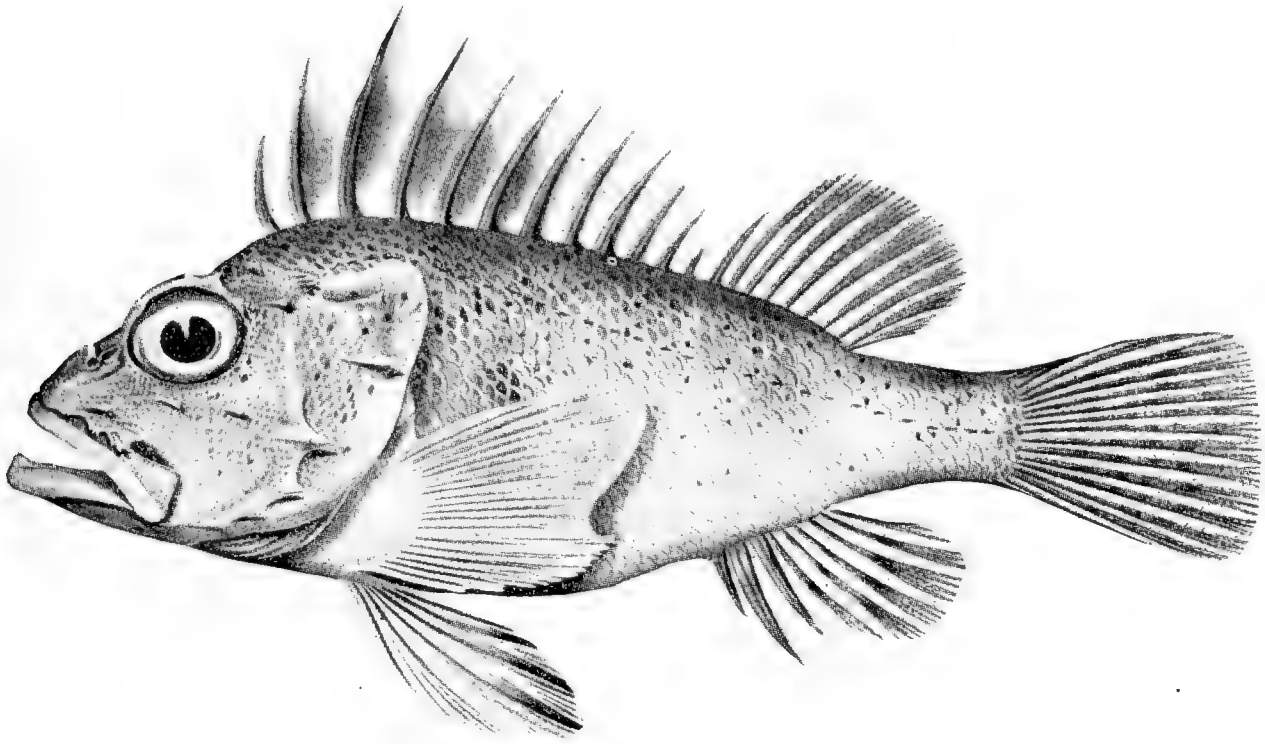

Fig. 269. *Neosebastes nigropunctatus.*

NEOSEBASTES THETIDIS Waite (Thetis Fish).

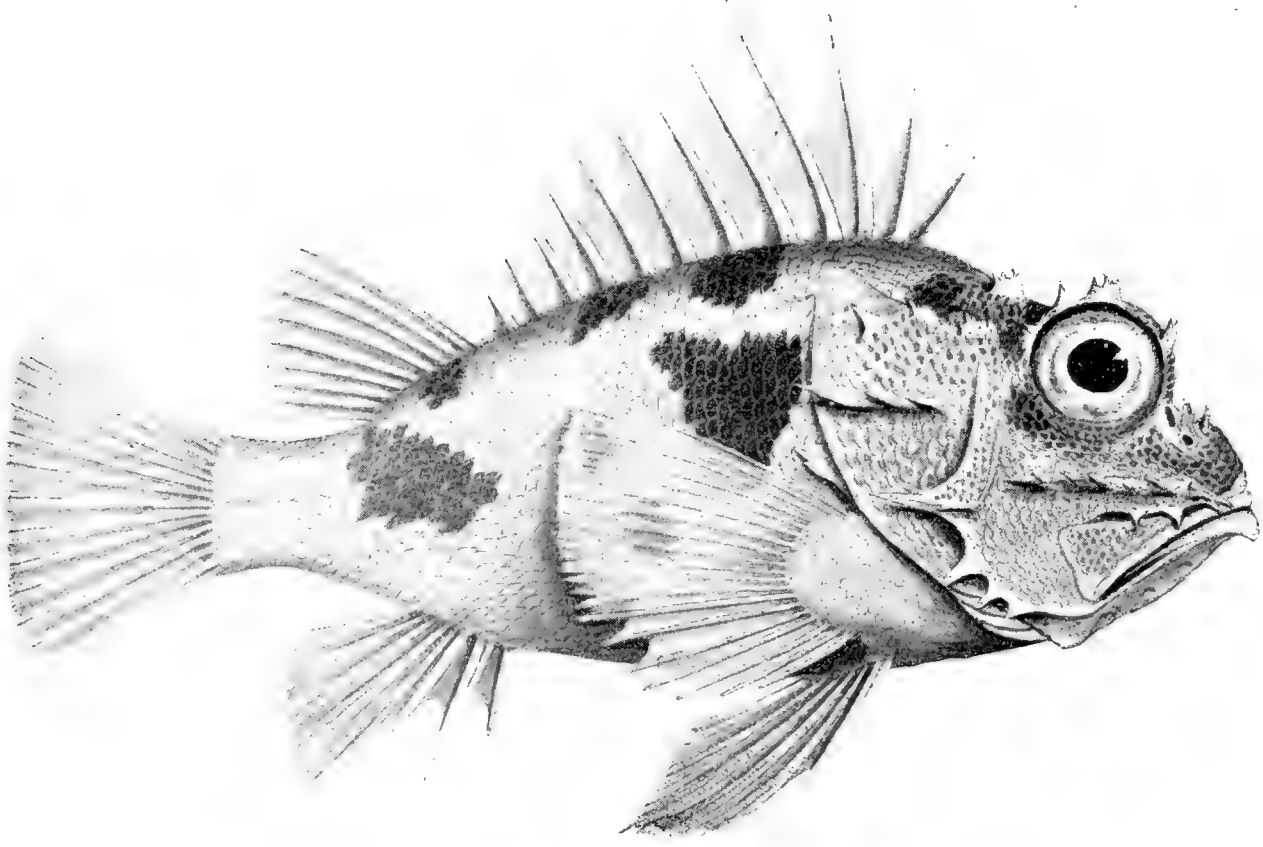

Fig. 270. *Neosebastes thetidis.*

Sebastes thetidis Waite, Mem. Aust. Mus., iv, 1899, p. 100, pl. xx.
Sebastodes thetidis Waite, Mem. N.S.W. Nat. Club., ii, 1904, p. 47.
Neosebastes thetidis McCull., Endeavour Res., iii, 1915, p. 154.

The name of this fish is associated with the first trawling venture of the N.S. Wales Government, conducted in 1898; H.M.C.S. "Thetis" being employed. The writer of this catalogue was in charge of the Zoological operations. The Thetis Fish has been obtained at Glenelg, S.A.

NEOSEBASTES PANTICA McCulloch & Waite.

Neosebastes pantica McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 64, pl. iv, fig. 1.

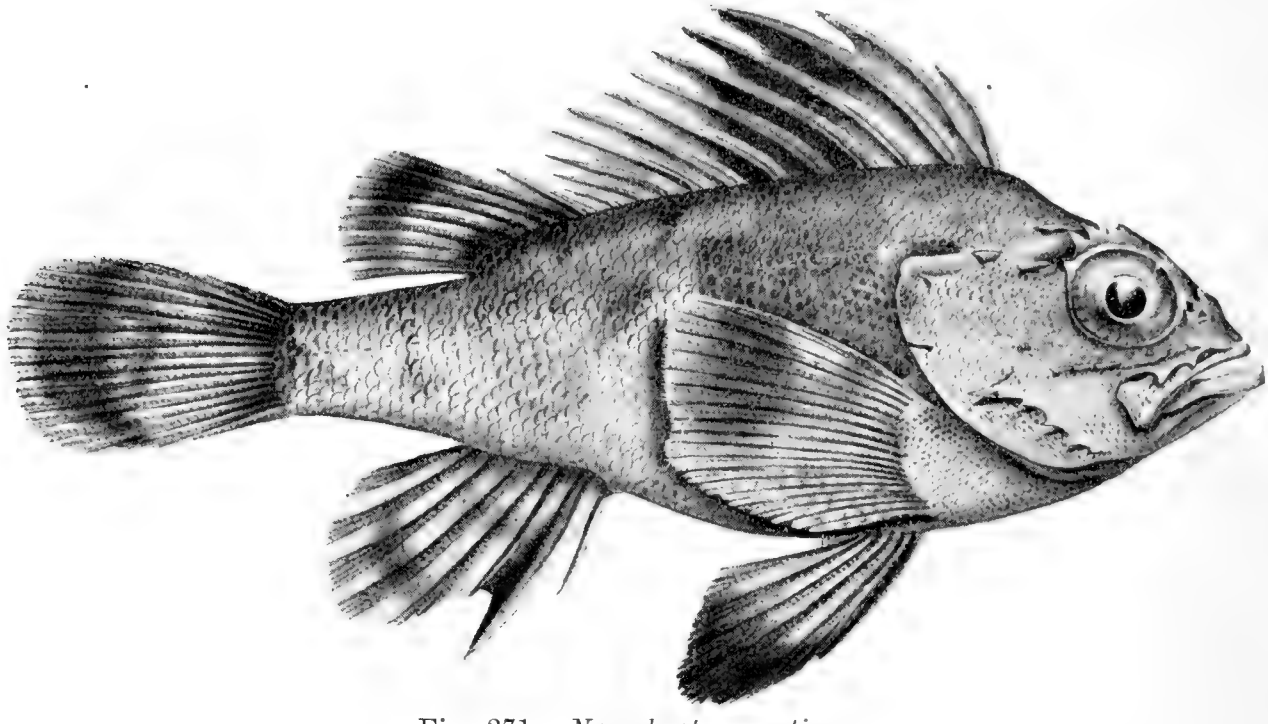

Fig. 271. *Neosebastes pantica.*

GYMNAPISTES Swainson, 1839 (marmoratus).

GYMNAPISTES MARMORATUS Cuvier & Valenciennes (Cobbler).

Apistus marmoratus Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 416; Valenc. in Cuv., Règ. Anim., Ill. Poiss., 1839, pl. xxiv, fig. 3.
Apistes marmoratus Cuv. (Griff.), Anim. King., x, 1834, pl. xxii, fig. 3.
Gymnapistes marmoratus Swains., Nat. Hist. Fish., ii, 1839, p. 266.
Pentaroge marmorata Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 132; McCull., Endeavour Res., iii, 1915, p. 161, pl. xxxvi, fig. 2.

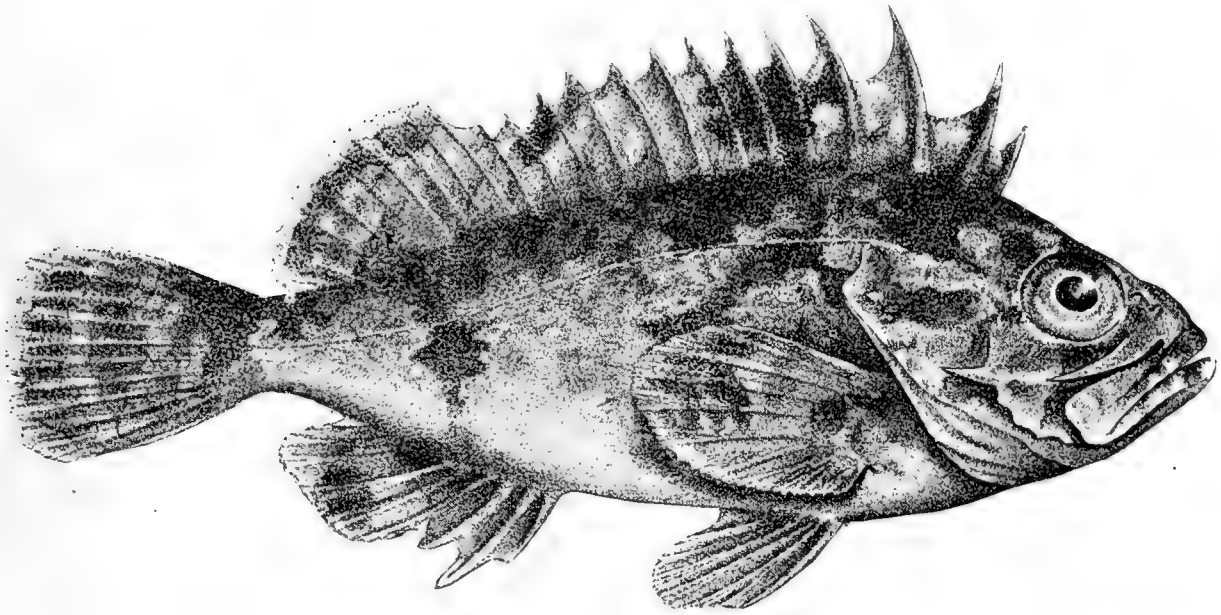

Fig. 272. *Gymnapistes marmoratus.*

Of no commercial value; known to every boy on the coast, and handled with caution on account of its venomous spines.

GLYPTAUCHEN Günther, 1860 (panduratus).

GLYPTAUCHEN PANDURATUS Richardson (Saddle-head).

Apistes panduratus Rich., P.Z.S., 1850, p. 58, pl. i, fig. 3, 4.
Glyptauchen panduratus Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 121.

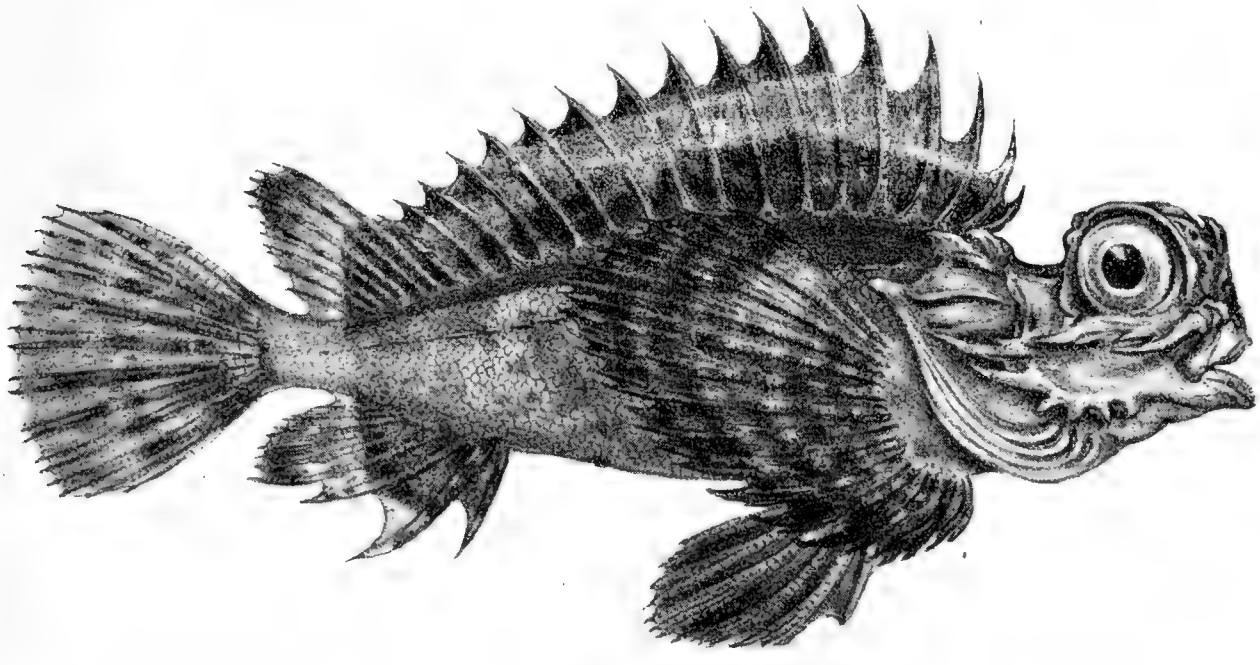

Fig. 273. *Glyptauchen panduratus.*

The Family *Scorpaenidae* furnishes some bizarre forms, of which this is one.

FAMILY APLOACTIDAE.

APLOACTIS Schlegel, 1843 (aspera).

APLOACTIS MILESII Richardson (Velvet-fish).

Aploactis milesii Rich., P.Z.S., 1850, p. 60, pl. i, fig. 1, 2.
Aploactisoma schomburgkii Cast., P.Z.S., Vict., i, 1872, p. 244 and ii, 1873, p. 64.

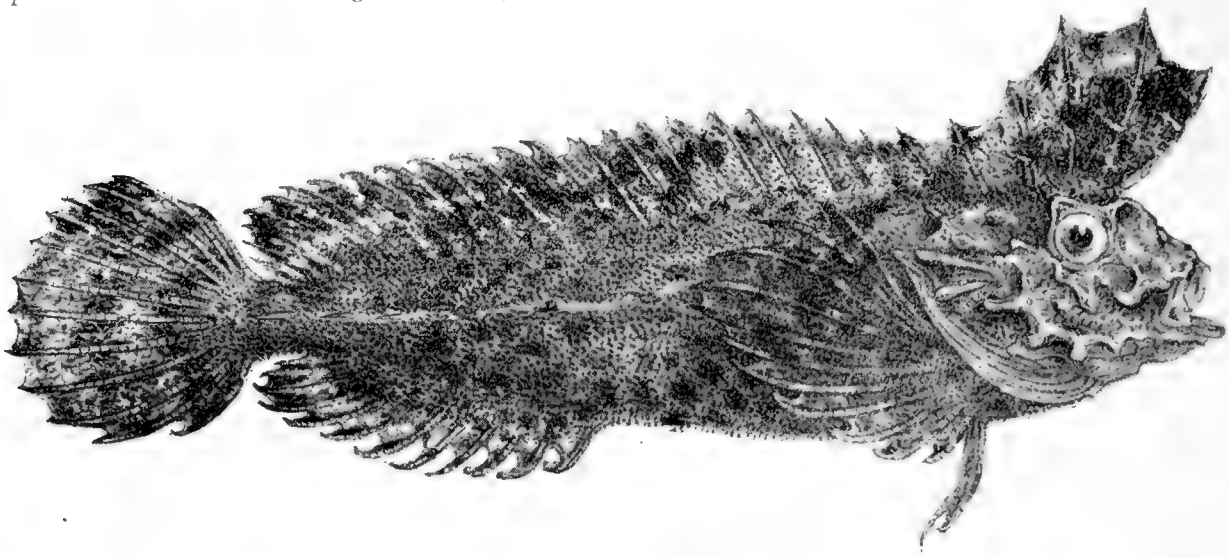

Fig. 274. *Aploactis milesii.*

The name Velvet-fish is also bestowed on *Gnathanacanthus,* to which it is more applicable.

FAMILY PATAECIDAE.

PATAECUS Richardson, 1844 (fronto).

PATAECUS FRONTO Richardson (Forehead Fish).

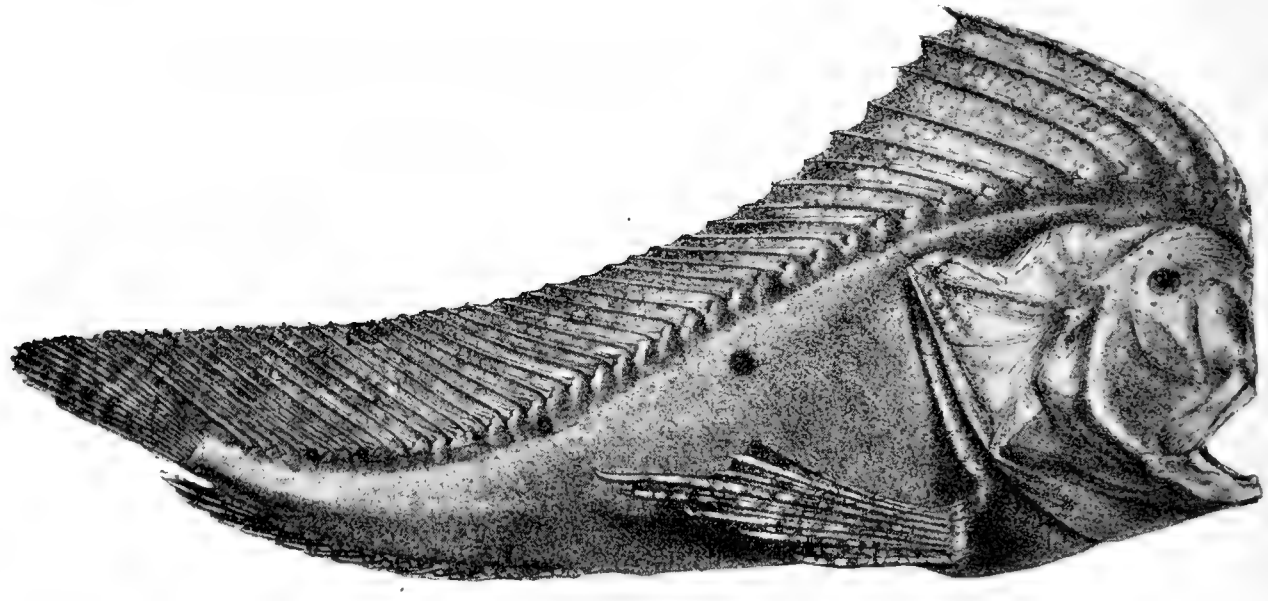

Fig. 275. *Pataecus fronto.*

Pataecus fronto Rich., A.M.N.H., xiv, 1844, p. 280 and Zool. Ereb. & Terr., 1845, p. 20, pl. xiii, fig. 1, 2.
Pataecus subocellatus Günth., P.Z.S., 1871, p. 665, pl. lxiv.

For obvious reasons this fish has also received the book name of Red Indian Fish.

PATAECUS MACULATUS Günther (Warty-fish).

Pataecus maculatus Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 292; Waite, Rec. Aust. Mus., vi, 1905, p. 75, pl. xv.
Pataecus armatus Johnston, P.R.S., Tasm., 1891, p. 33.

Fig. 276. *Pataecus maculatus.*

The members of the Family *Pataecidae* are small and of no value.

PATAECUS VINCENTII Steindachner.

Pataecus vincentii Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 195 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1085, pl. vii, fig. 2.

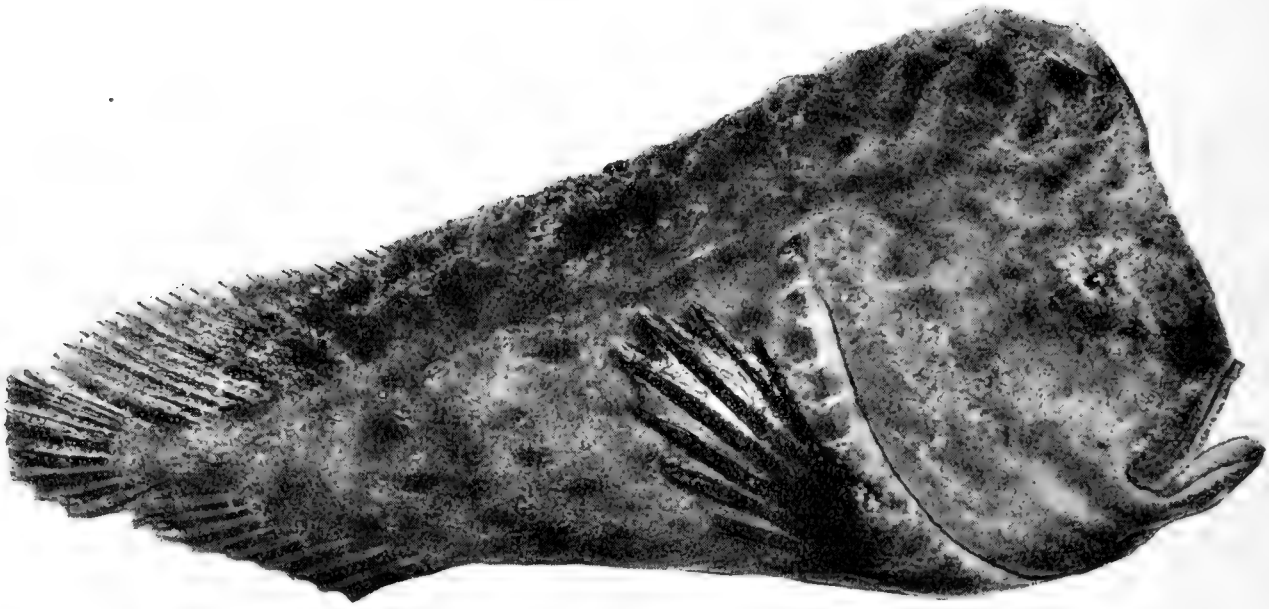

Fig. 277. *Pataecus vincentii.*

The specimen figured is the only adult example so far recorded; it was recently obtained at Glenelg after a severe storm.

NEOPATAECUS Steindachner, 1883 (maculatus=waterhousii).

NEOPATAECUS WATERHOUSII Castelnau.

Pataecus waterhousii Cast., P.Z.S., Viet., i, 1872, p. 244.

Neopataecus maculatus Steind., Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1087, pl. vii, fig. 3 (not Günth.).

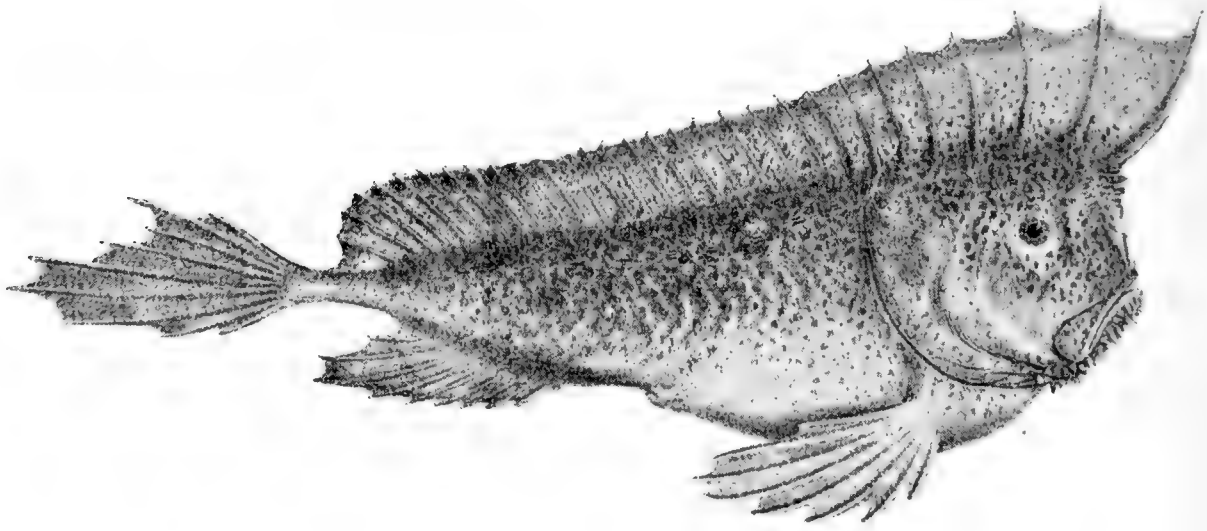

Fig. 278. *Neopataecus waterhousii.*

Readily distinguished from members of the allied genus by the separate tail fin.

FAMILY CONGIOPIDAE.

CONGIOPUS Perry, 1811 (peretus).

CONGIOPUS LEUCOPAECILUS Richardson (Pigfish).

Agriopus leucopaecilus Rich., Zool. Ereb. & Terr., 1846, p. 60, pl. xxxvii, fig. 4, 5.
Congiopodus leucopoecilus Gill, Mem. Nat. Acad. Sci. Wash., vi, 1893, p. 118.

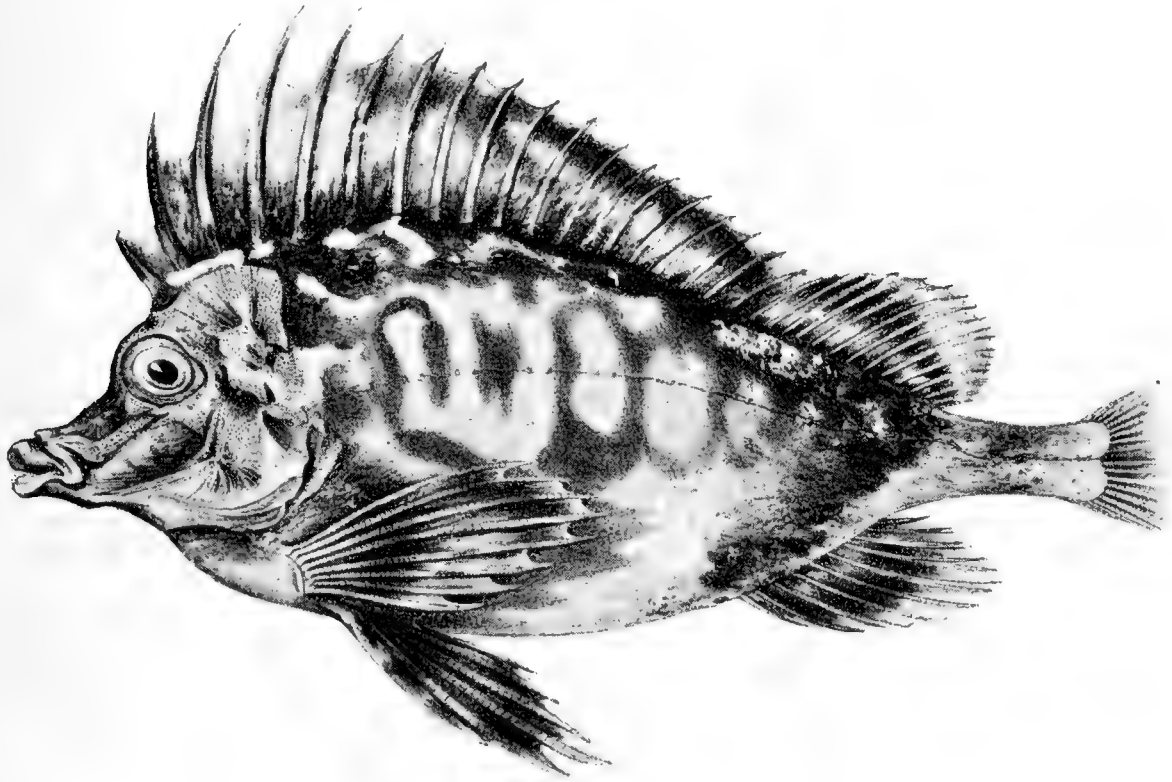

Fig. 279. *Congiopus leucopaecilus.*

FAMILY GNATHANACANTHIDAE.

GNATHANACANTHUS Bleeker, 1855 (goetzeei).

GNATHANACANTHUS GOETZEEI Bleeker (Velvet-fish).

Gnathanacanthus goetzeei Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 41, fig. 1.
Holoxenus cutaneus Günth., A.M.N.H. (4), xvii, 1876, p. 393.
Beridia flava Cast., P.L.S., N.S.W., ii, 1878, p. 229, pl. ii.
Gnathanacanthus goetzi Gill, P.U.S. Nat. Mus., xiv, 1891, p. 701, fig.

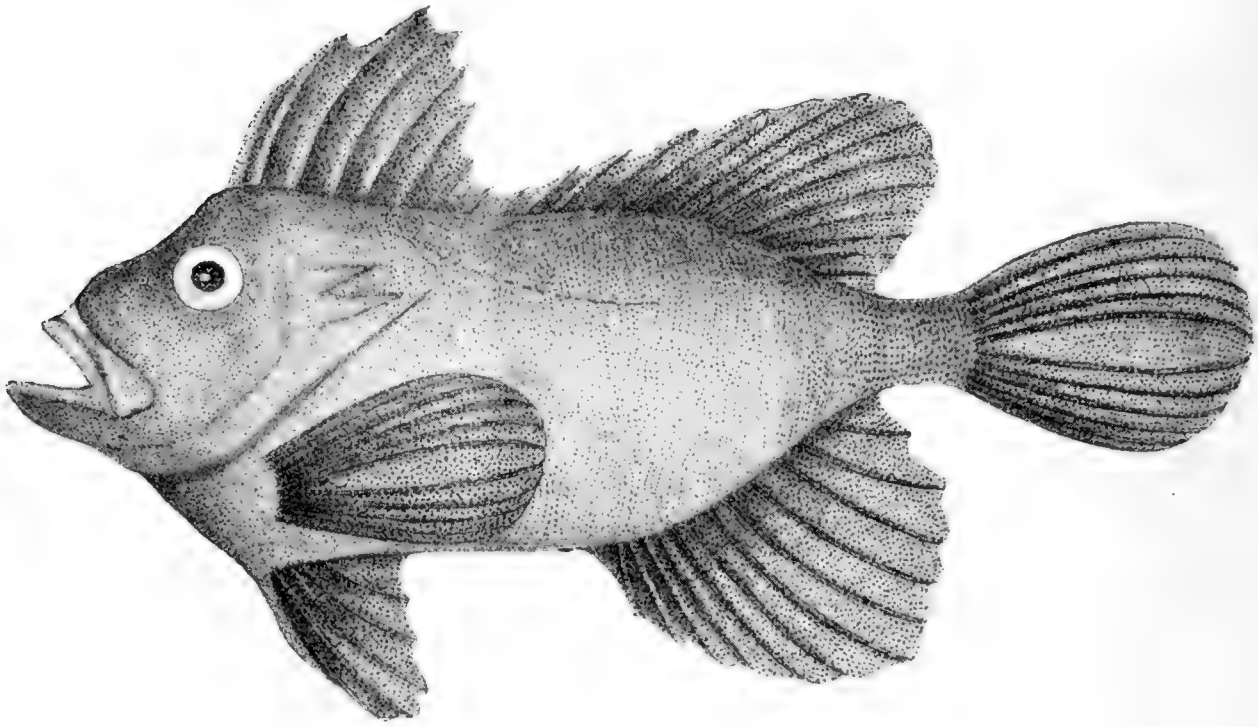

Fig. 280. *Gnathanacanthus goetzeei.*

Specimens obtained alive, in our waters, are of beautiful orange colour.

FAMILY PLATYCEPHALIDAE.

PLATYCEPHALUS Bloch, 1795 (spathula).

PLATYCEPHALUS FUSCUS Cuvier & Valenciennes (Dusky Flathead).

Platycephalus fuscus Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 241; Quoy & Gaim., Voy. Astrolabe, iii, 1835, p. 681, pl. x, fig. 1; Ogil., Edib. Fish. N.S.W., 1893, p. 105, pl. xxviii; Stead, Edib. Fish. N.S.W., 1908, p. 111, pl. lxxvii; Roughley, Fish. Aust., 1916, p. 181, pl. lxiii.

?Platycephalus cinereus Günth., P.Z.S., 1871, p. 662.

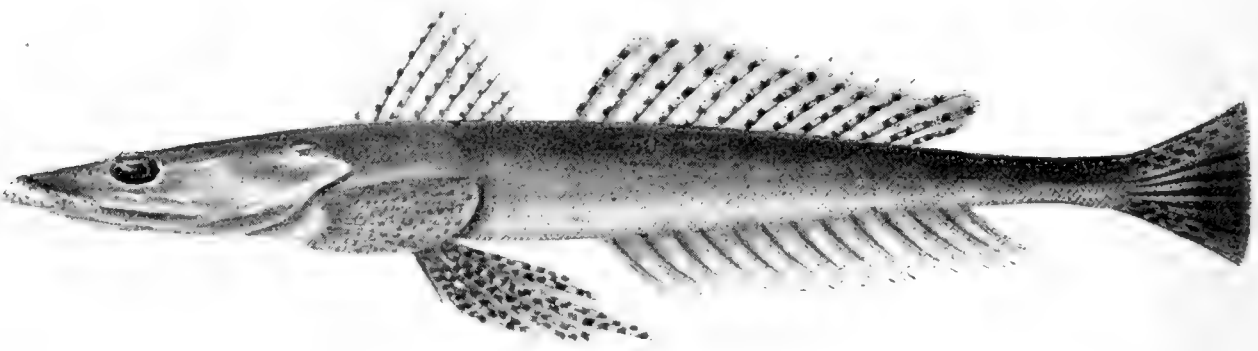

Fig. 281. *Platycephalus fuscus.*

All the Flatheads are good food. The Dusky and Sand Flatheads are the species commonly marketed in Adelaide.

PLATYCEPHALUS BASSENSIS Cuvier & Valenciennes (Sand Flathead).

Platycephalus bassensis Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 247; Quoy & Gaim., Voy. Astrolabe, iii, 1835, p. 683, pl. x, fig. 3; Stead, Edib. Fish. N.S.W., 1908, p. 112, pl. lxxviii.

Platycephalus tasmanius Rich., Zool. Ereb. & Terr., 1845, p. 23, pl. xviii, fig. 1, 2.

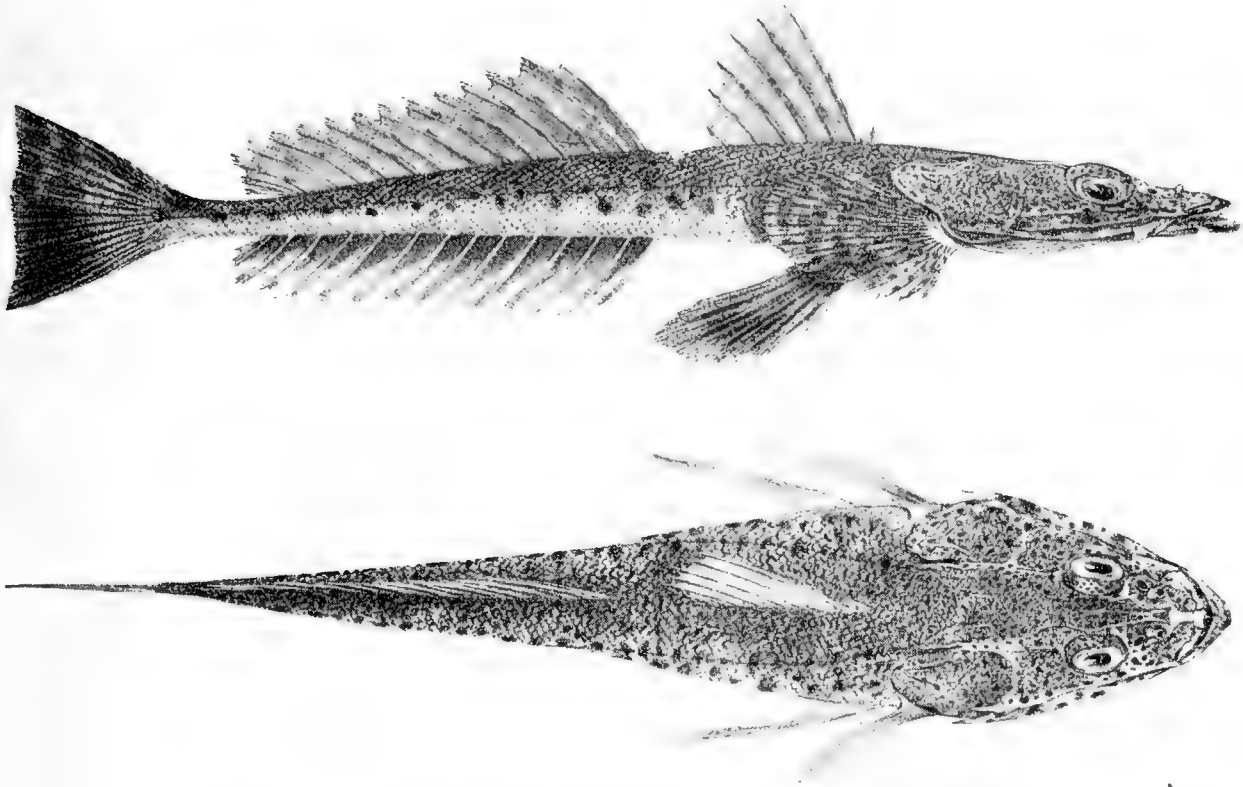

Fig. 282. *Platycephalus bassensis.*

PLATYCEPHALUS LAEVIGATUS Cuvier & Valenciennes.

Platycephalus laevigatus Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 248; Quoy & Gaim., Voy. Astrolabe, iii, 1835, p. 684, pl. x, fig. 4.

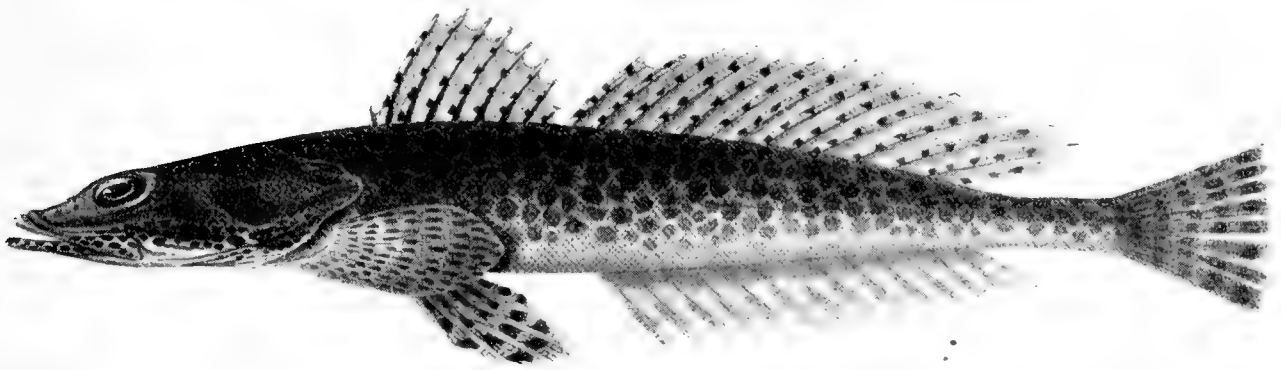

Fig. 283. *Platycephalus laevigatus.*

PLATYCEPHALUS INOPS Jenyns.

Platycephalus inops Jenyns, Zool. Beagle, iii, 1842, p. 33.

PLATYCEPHALUS HAACKEI Steindachner.

Platycephalus haackei Steind., Anz. Akad. Wiss. Wien, xx, 1883, p. 195 and Sitzb. Akad. Wiss. Wien, lxxxviii, 1884, p. 1081, pl. ii, fig. 2.

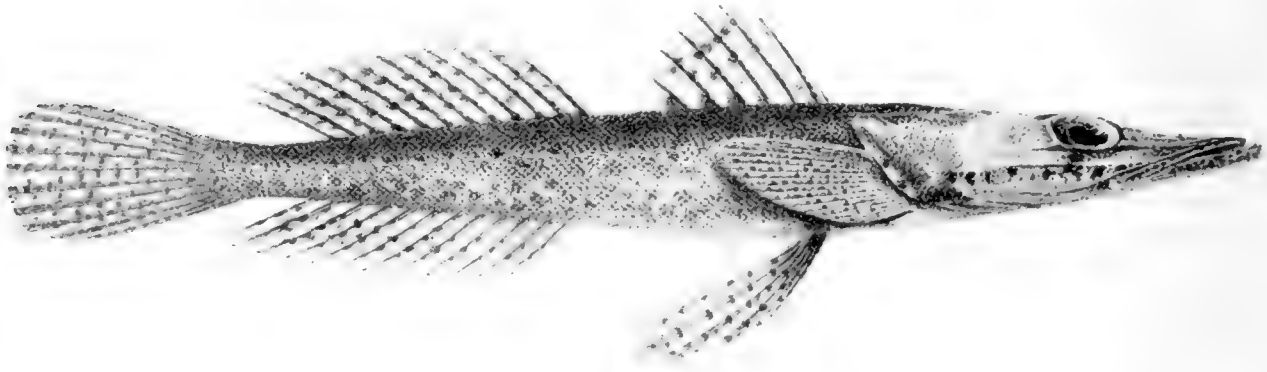

Fig. 285. *Platycephalus haackei.*

PLATYCEPHALUS SEMERMIS De Vis.

Platycephalus semermis De Vis, P.L.S., N.S.W., viii, 1883, p. 285.

NEOPLATYCEPHALUS Castelnau, 1872 (grandis).

NEOPLATYCEPHALUS GRANDIS Castelnau.

Neoplatycephalus grandis Cast., P.Z.S., Vict., i, 1872, p. 87.

NEOPLATYCEPHALUS CONATUS Waite & McCulloch (Deep-water Flathead).

Neoplatycephalus conatus Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 466, pl. xii.

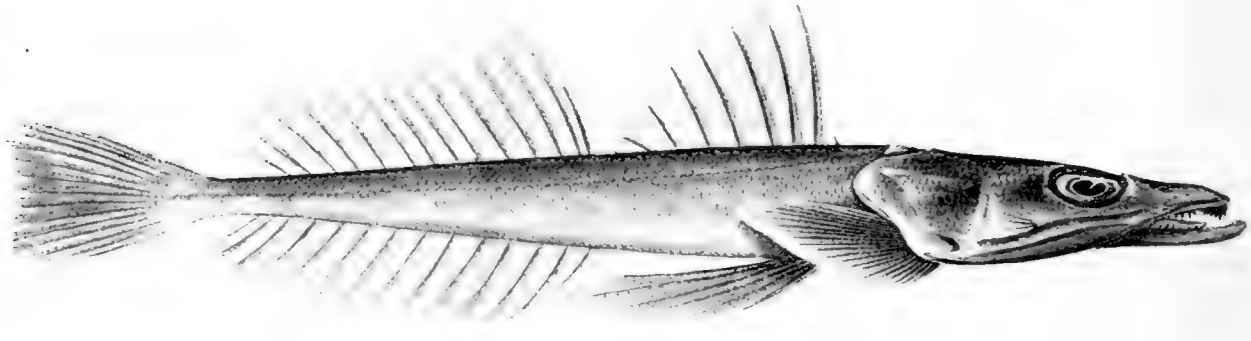

Fig. 288. *Neoplatycephalus conatus.*

THYSANOPHRYS Ogilby, 1898 (cirronasus).

THYSANOPHRYS CIRRONASUS Richardson (Tassel-snouted Flathead).

Platycephalus cirronasus Rich., Zool. Ereb. & Terr., 1846, p. 114, pl. li, fig. 7-10.
Thysanophrys cirronasus Ogil., P.L.S., N.S.W., xxiii, 1898, p. 40.

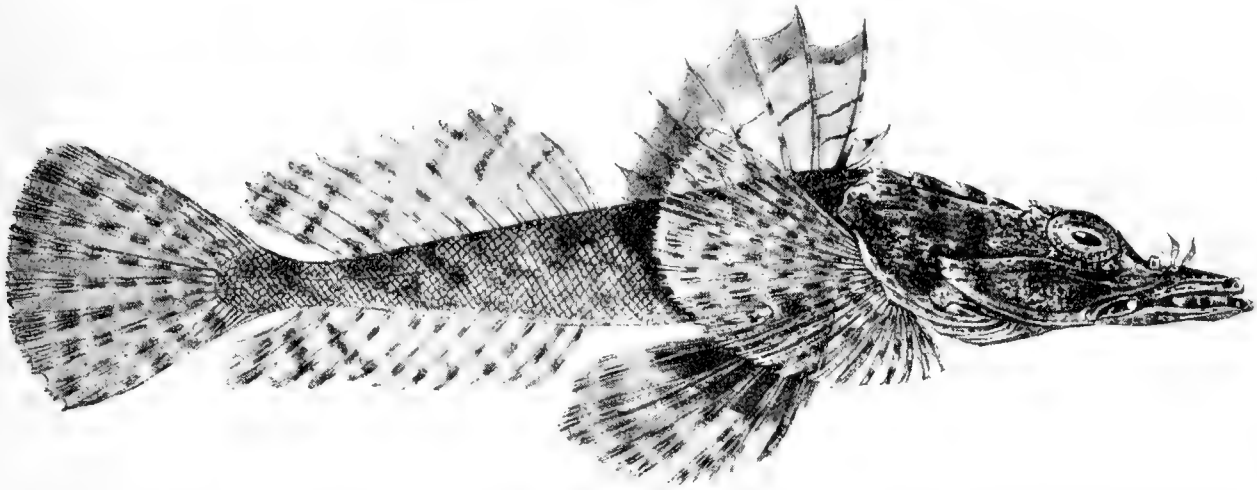

Fig. 289. *Thysanophrys cirronasus.*

FAMILY HOPLICHTHYIDAE.

HOPLICHTHYS Cuvier & Valenciennes, 1829 (langsdorfii).

HOPLICHTHYS HASWELLI McCulloch.

Hoplichthys haswelli McCull., Rec. Aust. Mus., vi, 1907, p. 351, pl. lxiv and Endeavour Res., ii, 1914, p. 132.

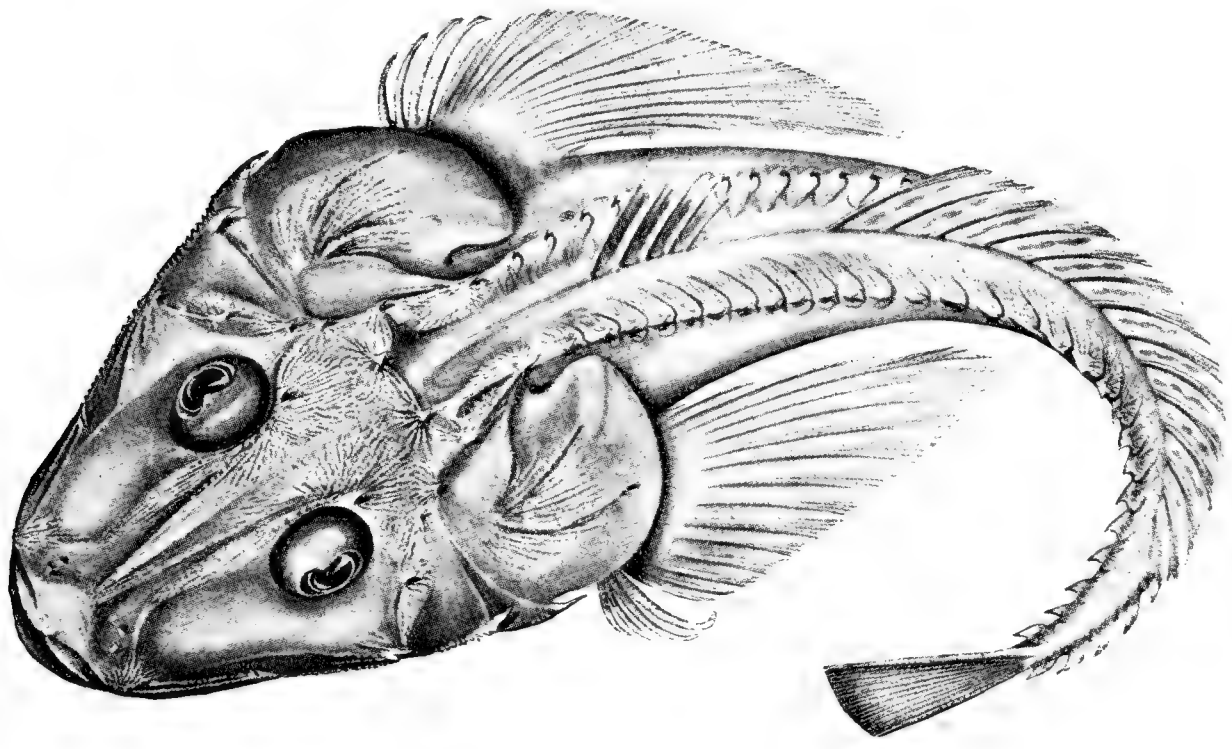

Fig. 290. *Hoplichthys haswelli.*

A deep-water form taken only by the trawl.

FAMILY TRIGLIDAE.

LEPIDOTRIGLA Günther, 1860 (aspera).

LEPIDOTRIGLA VANESSA Richardson (Butterfly Gurnard).

Trigla vanessa Rich., P.Z.S., 1839, p. 97 and T.Z.S., iii, 1849, p. 83, pl. v, fig. 1.
Lepidotrigla vanessa Günth., Cat. Fish. Brit. Mus., ii, 1860, p. 197; McCoy, Prod. Zool. Viet., dec. i, 1878, pl. v.

This and the next species are small fishes, having large scales compared with those of other Gurnards.

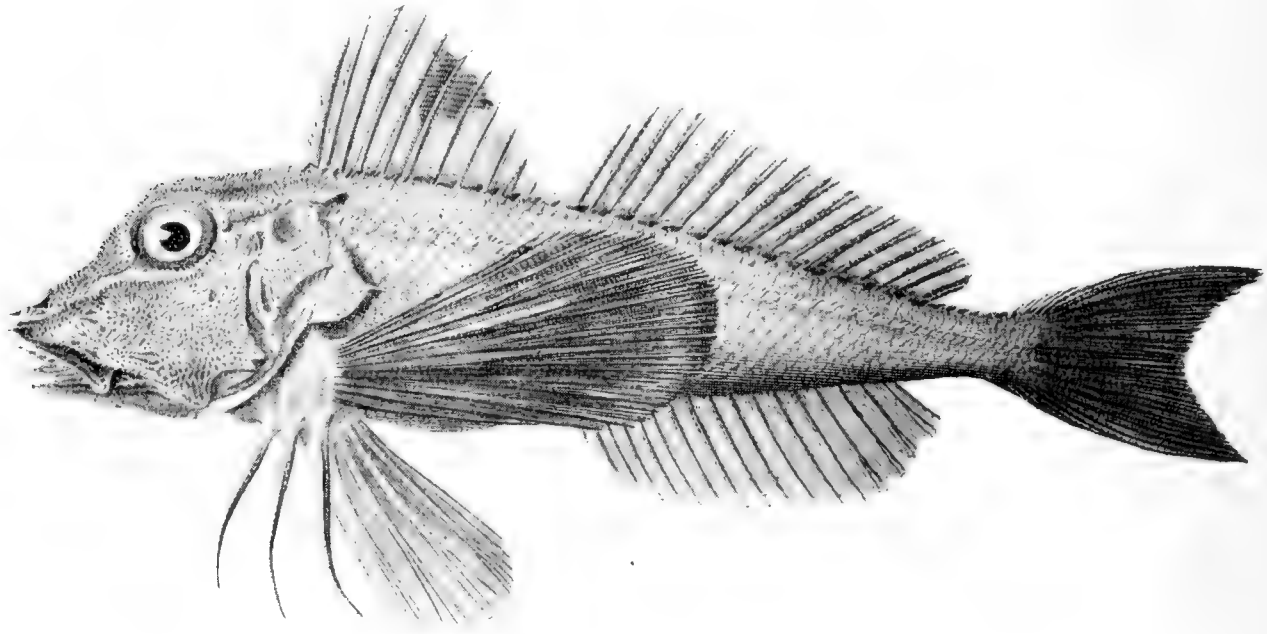

Fig. 291. *Lepidotrigla vanessa.*

PARATRIGLA Ogilby, 1911 (pleuracanthica).

PARATRIGLA PLEURACANTHICA Richardson.

Trigla pleuracanthica Rich., Zool. Ereb. & Terr., 1845, p. 23, pl. xvi, fig. 1-4.
Lepidotrigla pleuracanthica Rams. & Ogil., P.L.S., N.S.W., x, 1886, p. 578.
Paratrigla pleuracanthica Ogil., Ann. Qld. Mus., x, 1911, p. 56.

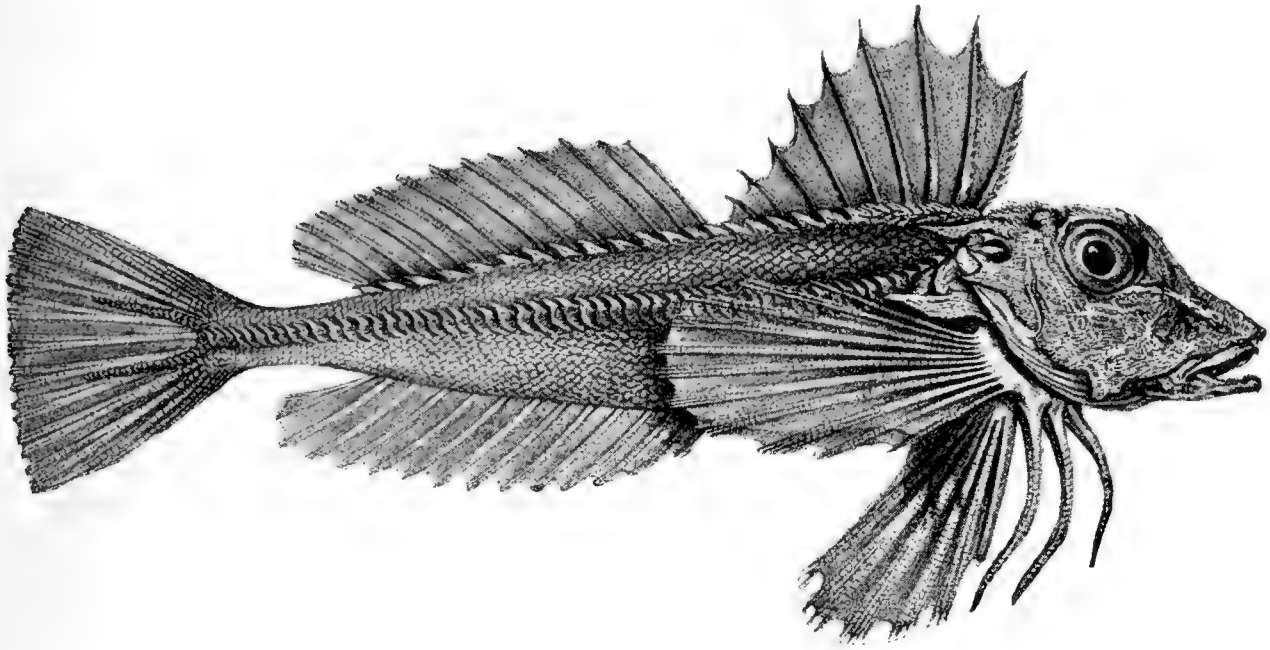

Fig. 292. *Paratrigla pleuracanthica.*

PTERYGOTRIGLA Waite, 1899 (polyommata).

PTERYGOTRIGLA POLYOMMATA Richardson (Flying Gurnard).

Trigla polyommata Rich., P.Z.S., 1839, p. 96 and T.Z.S., iii, 1849, p. 87, pl. v, fig. 2; Ogil., Edib. Fish. N.S.W., 1893, p. 111.

Hoplonotus polyommatus Guich., Ann. Soc. Linn. Maine-et-Loire, Ichth., ix, 1866, p. 3.

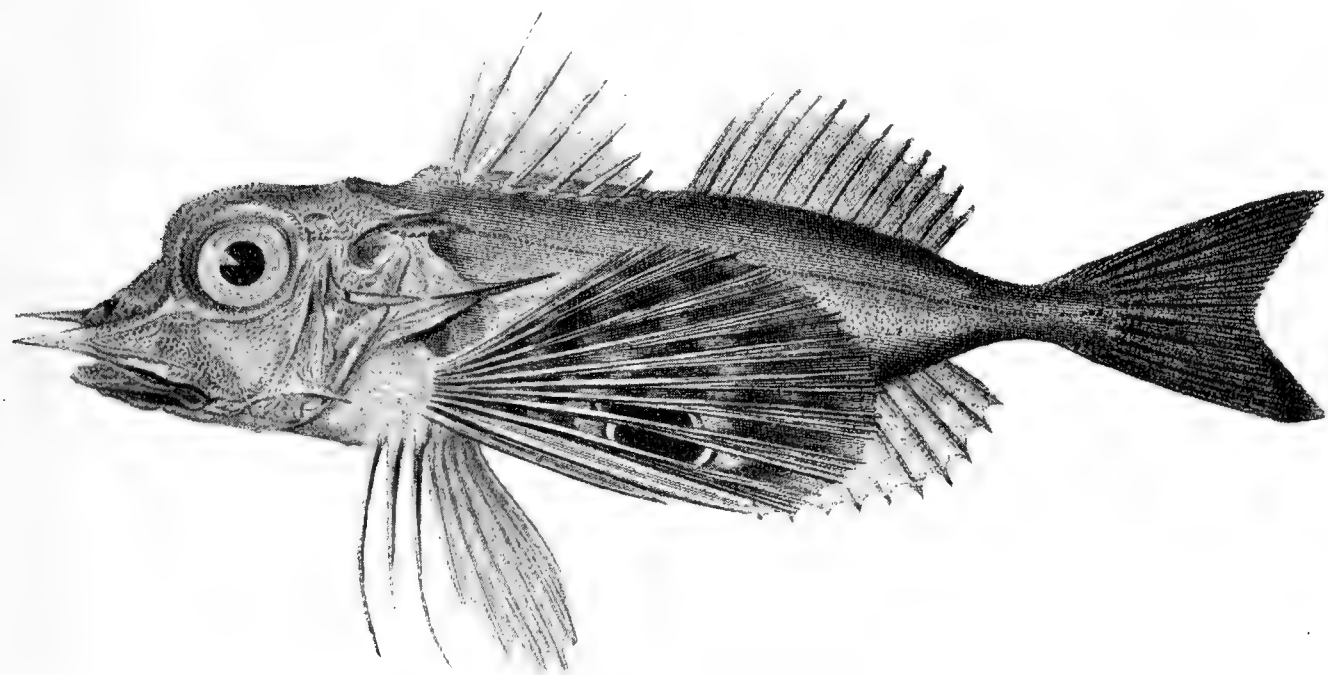

Fig. 293. *Pterygotrigla polyommata.*

Trigla amoena Cast., P.Z.S., Viet., ii, 1873, p. 131.
Pterygotrigla polyommata Waite, Mem. Aust. Mus., iv, 1899, p. 108; Roughley, Fish. Aust., 1916, p. 186, pl. lxv.

The name Flying Gurnard is bestowed on account of its reputed habit of jumping out of the water.

CHELIDONICHTHYS Kaup, 1873 (hirundo).

CHELIDONICHTHYS KUMU Lesson & Garnot (Red Gurnard).

Trigla kumu Less. & Garn., Voy. Coquille, Poiss., 1826, p. 214, pl. xix; McCoy, Prod. Zool. Viet., dec. i, 1878, pl. vi; Ogil., Edib. Fish. N.S.W., 1893, p. 109, pl. xxix.
Trigla spinosa McClell., Calcutta Journ. Nat. Hist., iv, 1844, p. 396, pl. xxii, fig. 2.
Trigla dorsomaculata Steind., Sitz. Akad. Wiss. Wien, lxxiv, 1876, p. 216.
Chelidonichthys kumu Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 49; Stead, Edib. Fish. N.S.W., 1908, p. 114, pl. lxxix; Roughley, Fish. Aust., 1916, p. 184, pl. lxiv.

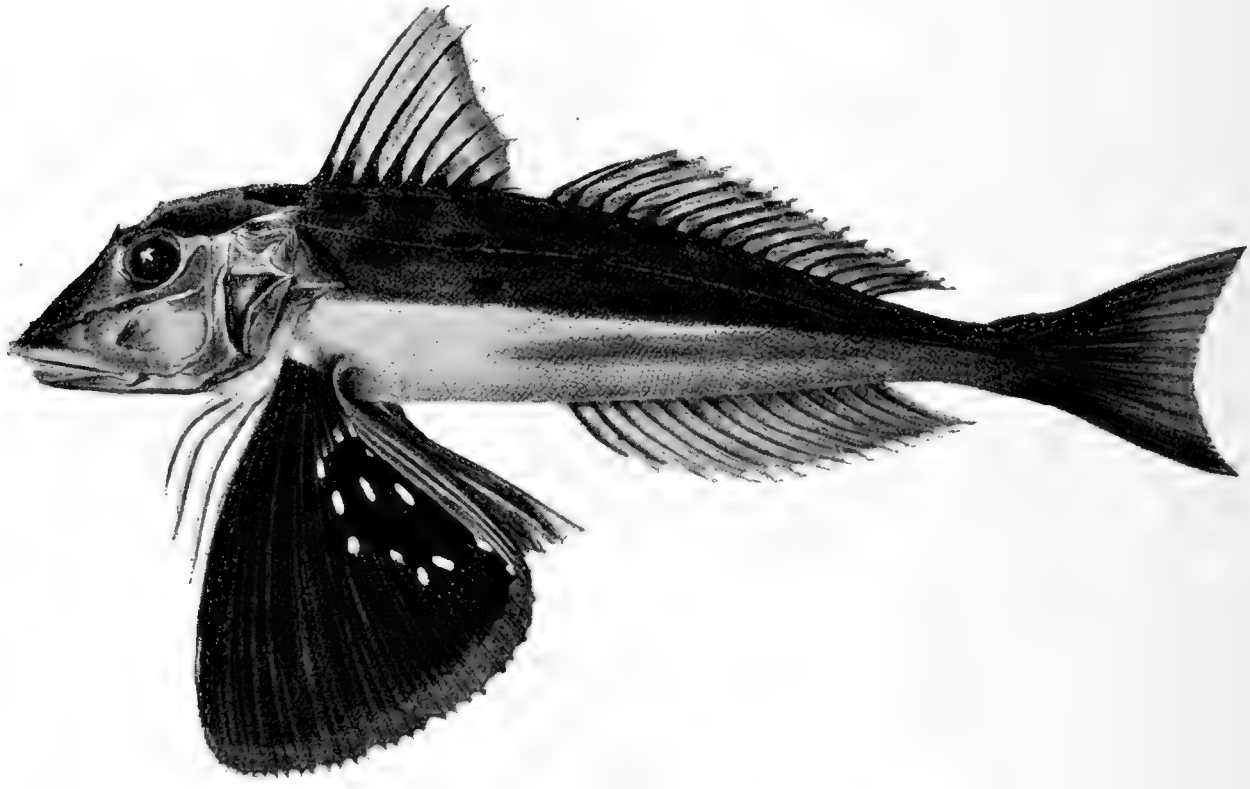

Fig. 294. *Chelidonichthys kumu.*

This and the Flying Gurnard are obtained plentifully where the trawl is operated; both species furnish excellent food, always in demand.

ORDER XENOPTERI.

FAMILY GOBIESOCIDAE.

ASPASMOGASTER Waite, 1907 (spatula).

ASPASMOGASTER TASMANIENSIS Günther (Cling-fish).

Crepidogaster tasmaniensis Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 507.

Members of this Family are called Cling-fishes because they fasten themselves to stones and seaweed by means of a sucker formed by their ventral fins. All are small and of no economic value.

ASPASMOGASTER SPATULA Günther (Cling-fish).

Crepidogaster spatula Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 508; Waite, Rec. Aust. Mus., vi, 1906, p. 201, pl. xxxvi, fig. 4.
Aspasmogaster spatula Waite, *op. cit.*, 1907, p. 315.

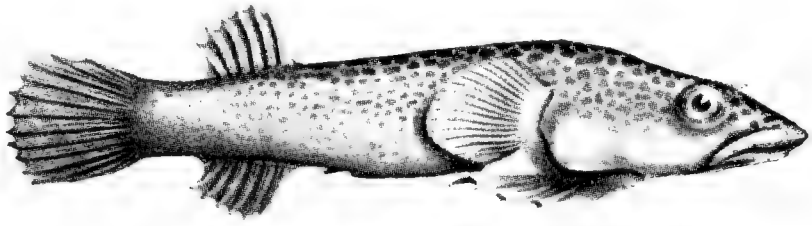

Fig. 296. *Aspasmogaster spatula.*

DIPLOCREPIS Günther, 1861 (puniceus).

DIPLOCREPIS COSTATUS Ogilby (Cling-fish).

Diplocrepis costatus Ogil., P.L.S., N.S.W., x, 1885, p. 270; Waite, Rec. Aust. Mus., v, 1904, p. 179, p. xxiv, fig. 1.

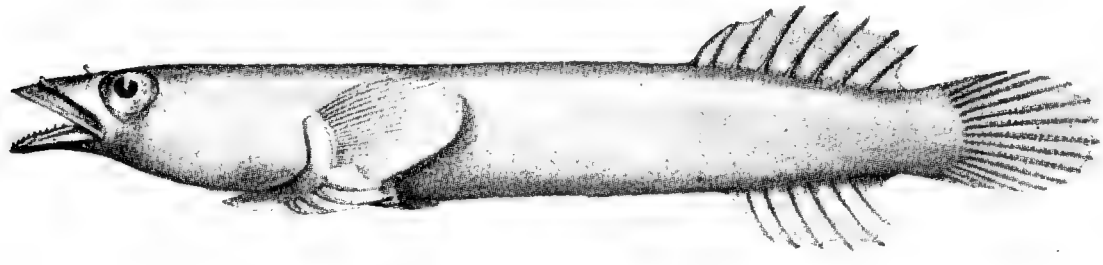

Fig. 297. *Diplocrepis costatus.*

DIPLOCREPIS PARVIPINNIS Waite (Small-finned Cling-fish).

Diplocrepis parvipinnis Waite, Rec. Aust. Mus., vi, 1906, p. 202, pl. xxxvi, fig. 3.

Fig. 298. *Diplocrepis parvipinnis.*

ORDER PEDICULATI.

SUB-ORDER LOPHIOIDEA.

FAMILY ANTENNARIIDAE.

RHYCHERUS Ogilby, 1907 (wildii=filamentosus).

RHYCHERUS FILAMENTOSUS Castelnau (Tasselled Frog-fish).

Chironectes filamentosus Cast., P.Z.S., Vict., i, 1872, p. 244 and ii, 1873, p. 65.
Antennarius filamentosus Macl., P.L.S., N.S.W., v, 1881, p. 579.
Chironectes bifurcatus McCoy, Prod. Zool. Vict., dec. xiii, 1886, pl. cxxiii.

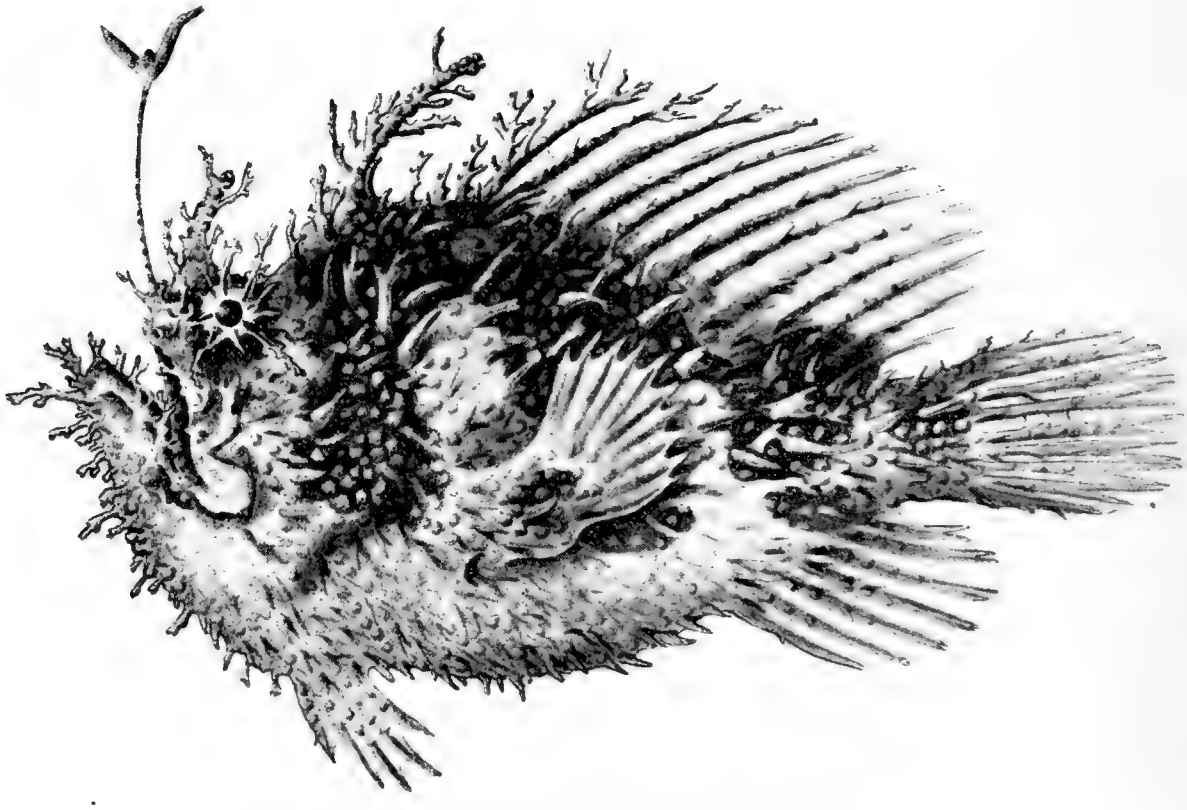

Fig. 299. *Rhycherus filamentosus.*

Rhycherus wildii and *R. bifurcatus* Ogil., P.R.S., Qld., xx, 1907, p. 18, 19.
Rhycherus filamentosus McCull., Mem. Qld. Mus., v, 1916, p. 68; McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 70, pl. vi, fig. 3 and text fig. 31.

The quaint sluggish fishes of this and the next Family are also known as Fishing-frogs, the flexible rod-like spine on the snout being furnished with a mobile fleshy lure that attracts smaller fishes to their destruction.

HISTIOPHRYNE Gill, 1863 (bougainvilli).

HISTIOPHRYNE BOUGAINVILLI Cuvier & Valenciennes (Smooth Frog-fish).

Chironectes bougainvilli Cuv. & Val., Hist. Nat. Poiss., xii, 1837, p. 431.
Antennarius bougainvillii Günth., Cat. Fish. Brit. Mus., iii, 1861, p. 199.
Histiophryne bougainvillii Gill, Proc. Acad. Nat. Sci. Phil., 1863, p. 90; McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 72, pl. vii, fig. 1.

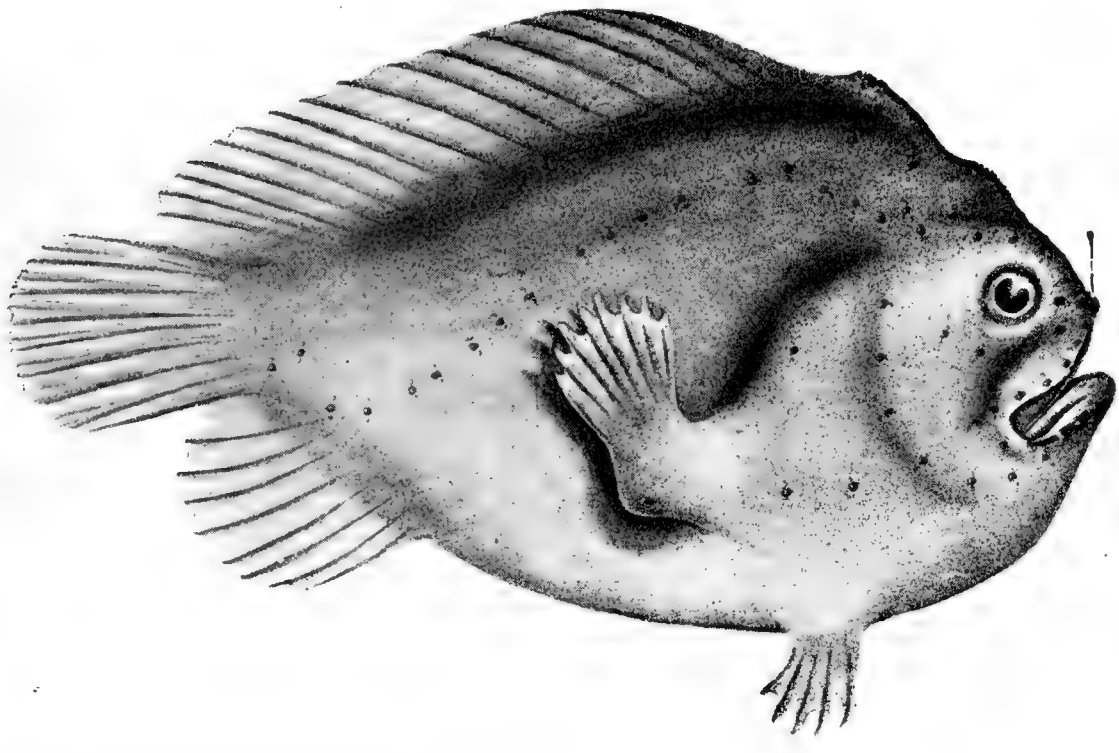

Fig. 300. *Histiophryne bougainvilli.*

HISTIOPHRYNE SCORTEA McCulloch & Waite (White-spotted Frog-fish).

Histiophryne scortea McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 74, pl. vii, fig. 2 and var. *inconstans*, *op. cit.*, p. 75.

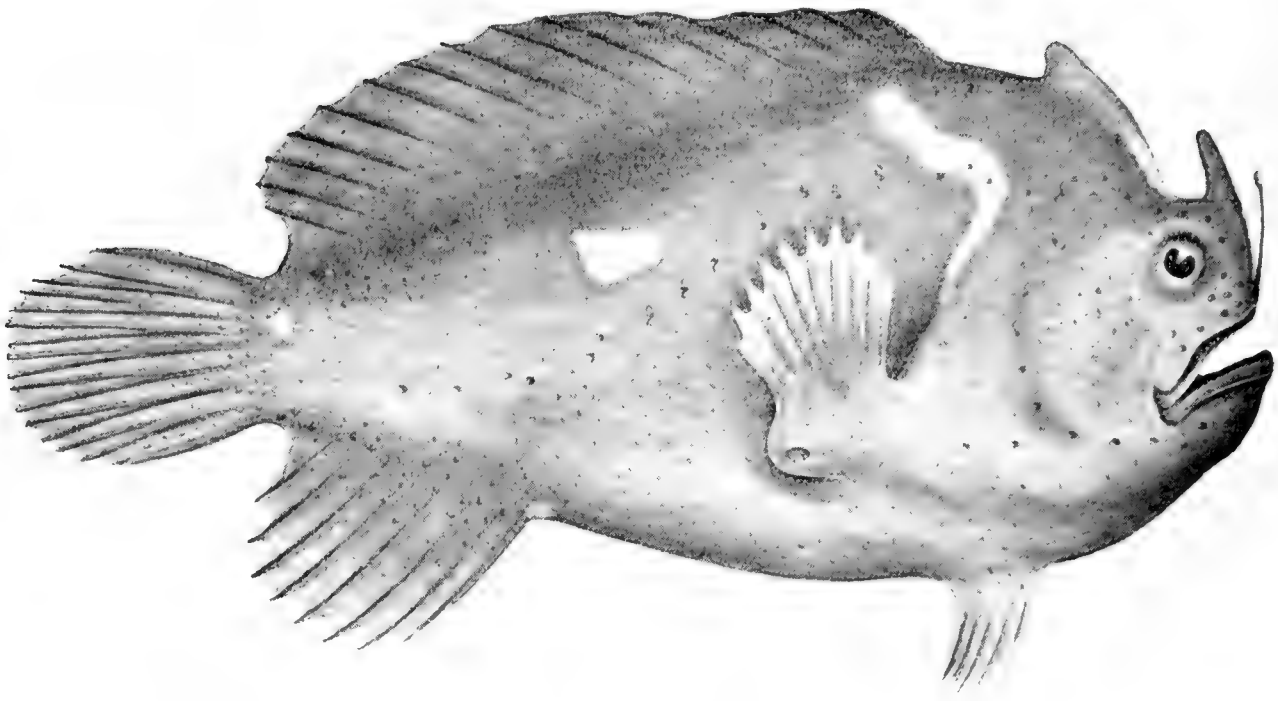

Fig. 301. *Histiophryne scortea.*

ECHINOPHRYNE McCulloch & Waite, 1918 (crassispina).

ECHINOPHRYNE CRASSISPINA McCulloch & Waite (Prickly Frog-fish).

Echinophryne crassispina McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 67, pl. vi, fig. 2.

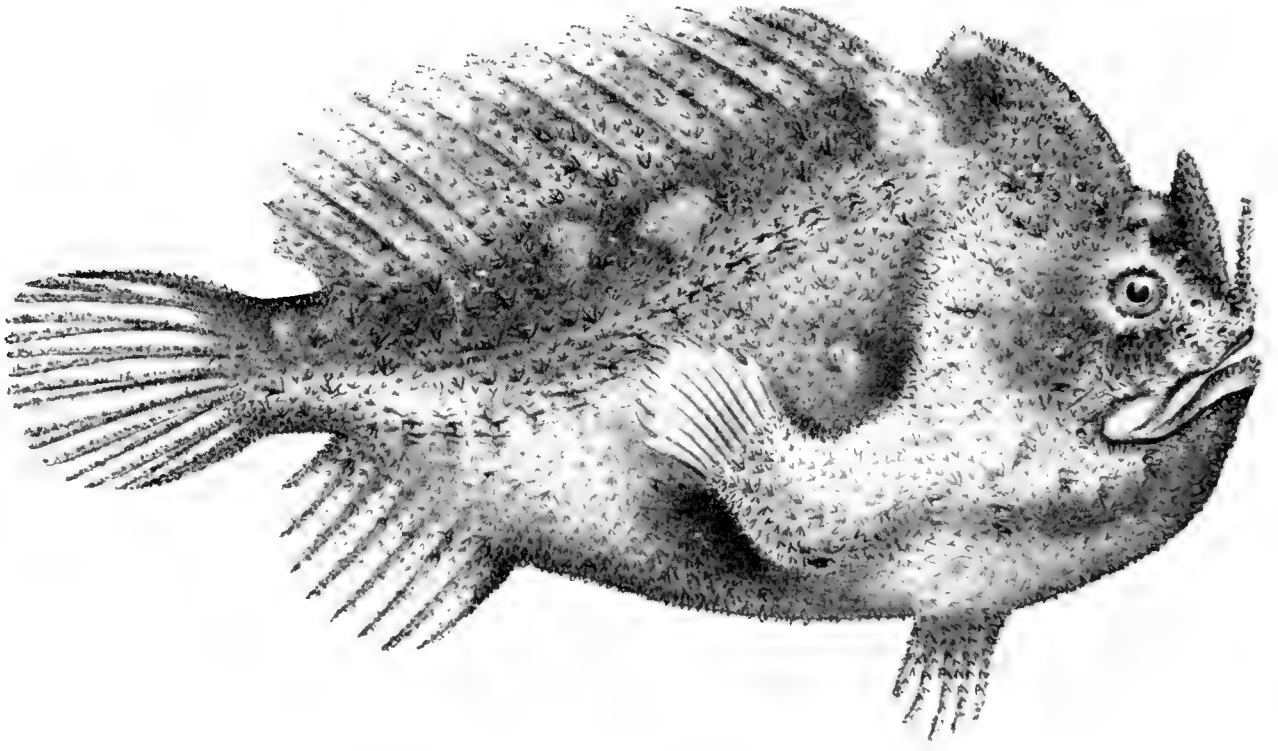

Fig. 302. *Echinophryne crassispina.*

TRICHOPHRYNE McCulloch & Waite, 1918 (mitchellii).

TRICHOPHRYNE MITCHELLII Morton (Bristly Frog-fish).

Antennarius mitchellii Mort., P.R.S., Tasm., 1897, p. 98.

Trichophryne mitchellii McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 68, pl. vi, fig. 1.

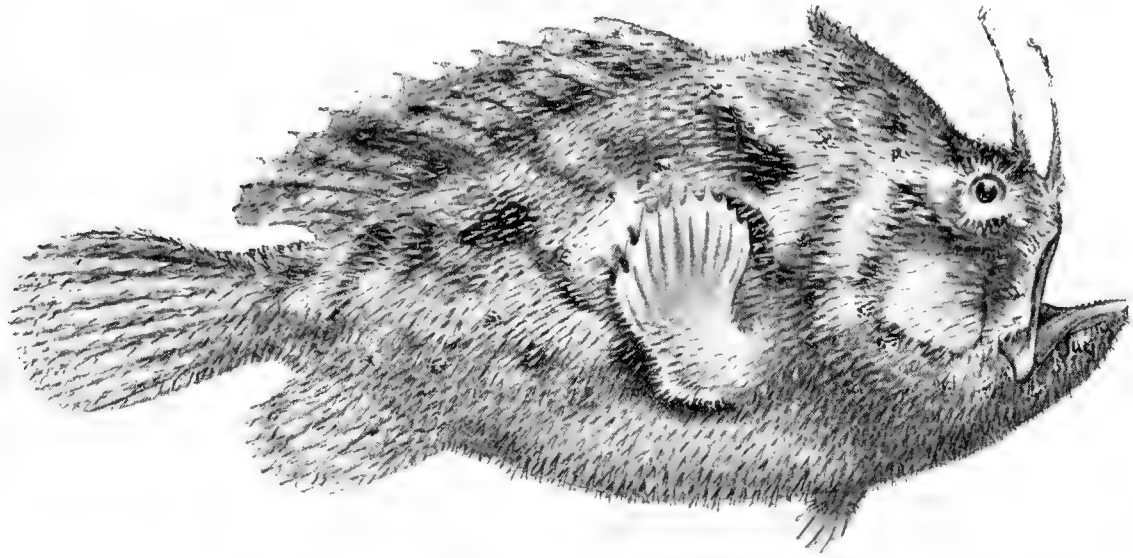

Fig. 303. *Trichophryne mitchellii.*

FAMILY BRACHIONICHTHYIDAE.

SYMPTERICHTHYS Gill, 1878 (laevis).

SYMPTERICHTHYS VERRUCOSUS McCulloch & Waite (Warty Frog-fish).

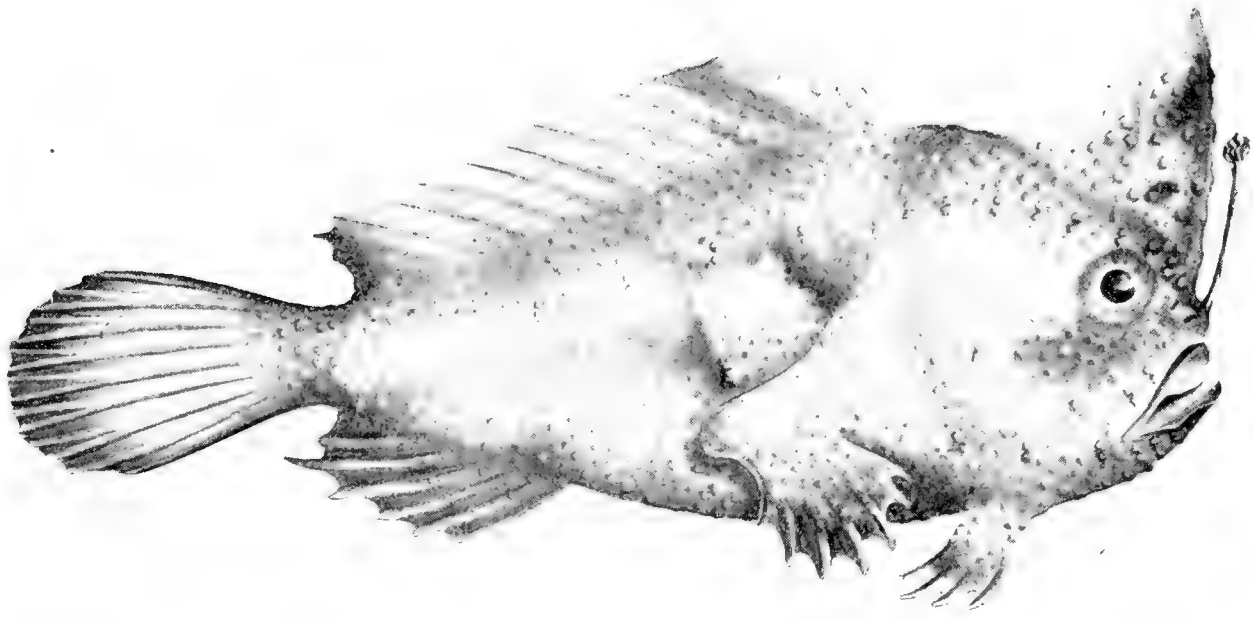

Fig. 304. *Sympterichthys verrucosus.*

Sympterichthys verrucosus McCull. & Waite, Rec. S. Aust. Mus., i, 1918, p. 76, pl. vii, fig. 3.

ORDER PLECTOGNATHI.

DIVISION SCLERODERMI.

FAMILY MONACANTHIDAE.

CANTHERINES Swainson, 1839 (nasutus).

CANTHERINES GRANULATUS Shaw (Rough Leather-jacket).

Balistes granulata Shaw, in White's Voy. N.S.W., 1790, p. 295, pl. xxxix, fig. 2.
Monacanthus granulatus Rich., Zool. Ereb. & Terr., 1846, p. 63, pl. xl, fig. 1, 2.
Monacanthus granulosus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 243.
Monacanthus perulifer Cast., P.Z.S., Viet., i, 1872, p. 245.
Monacanthus margaritifer and *M. brunneus* Cast., *op. cit.*, ii, 1873, p. 80, 145.
Monacanthus obscurus Cast., Res. Fish. Aust., 1875, p. 51.
Monacanthus sancti-joanni Cast., P.L.S., N.S.W., ii, 1878, p. 246.
Pseudomonacanthus granulatus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.

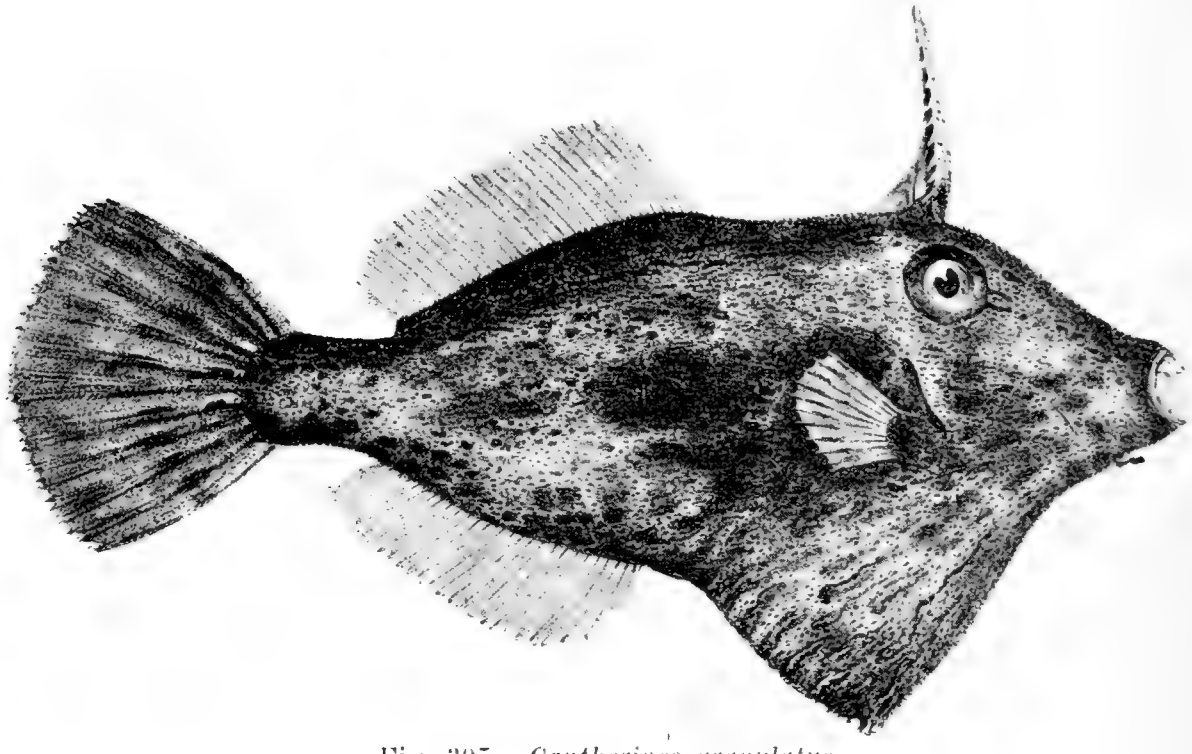

Fig. 305. *Cantherines granulatus.*

The Leather-jackets are excellent food, but require to be skinned before cooking. As their appearance is prejudicial they are often skinned before being exposed for sale.

CANTHERINES HIPPOCREPIS Quoy & Gaimard (Horseshoe Leather-jacket).

Balistes hippocrepis Quoy & Gaim., Voy. Uran. & Physic., 1824, p. 212.
Aleuterius variabilis Rich., Zool. Ereb. & Terr., 1846, p. 67, pl. liii, fig. 1-7.
Monacanthus hippocrepis Holl., Ann. Sci. Nat. (4), ii, 1854, p. 338; McCoy, Prod. Zool. Vict., dec. xiii, 1886, pl. cxxv; Ogil., Edib. Fish. N.S.W., 1893, p. 194, pl. xlviii.
Pseudomonacanthus hippocrepis Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.

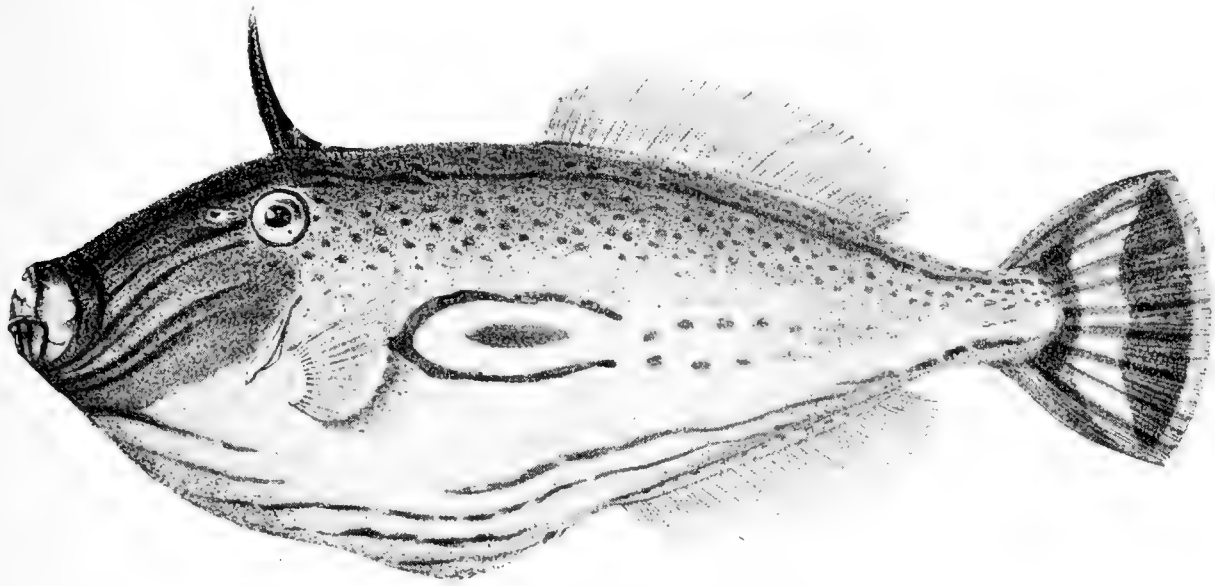

Fig. 306. *Cantherines hippocrepis.*

A large and well-flavoured species, reaching a length of 18 inches.

CANTHERINES BROWNII Richardson (Toothbrush Leather-jacket).

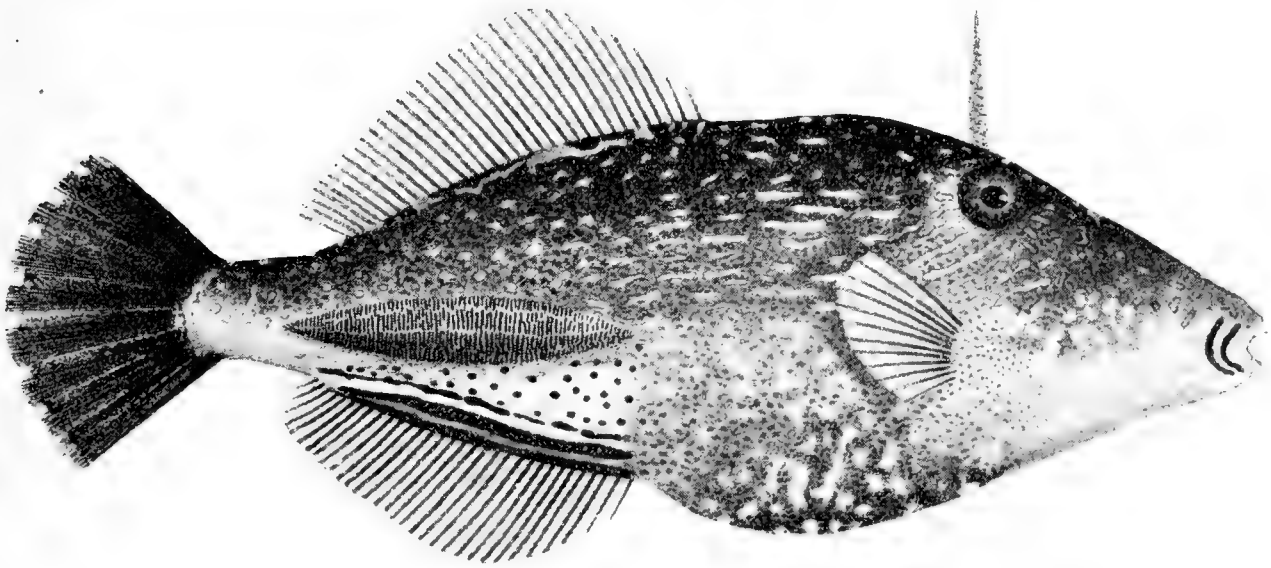

Fig. 307. *Cantherines brownii.*

Aleuterius brownii Rich., Zool. Ereb. & Terr., 1846, p. 68.
Monacanthus linco-guttatus Holl., Ann. Sci. Nat. (4), ii, 1854, p. 352.
Monacanthus brownii Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 249; McCoy, Prod. Zool. Vict., dec. xiii, 1886, pl. cxxiv.
Monacanthus yagoi Cast., P.L.S., N.S.W., ii, 1878, p. 245.

The patch of bristles on each side of the tail is responsible for the common name.

CANTHERINES AYRAUDI Quoy & Gaimard (Yellow Leather-jacket).

Balistes ayraud Quoy & Gaim., Voy. Uran. & Physic., 1824, p. 216, pl. xlvii, fig. 2.
Aleuteres velutinus Jenyns, Voy. Beagle, iii, 1842, p. 157.
Monacanthus vittatus Rich., Zool. Ereb. & Terr., 1846, p. 66.
Monacanthus frauenfeldii Kner, Reise Novara, 1867, p. 397.
Monacanthus ayraudi Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 244; Ogil., Edib. Fish. N.S.W., 1893, p. 196.
Pseudomonacanthus ayraudi Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56; Roughley, Fish. Aust., 1916, p. 188, pl. lxvi.

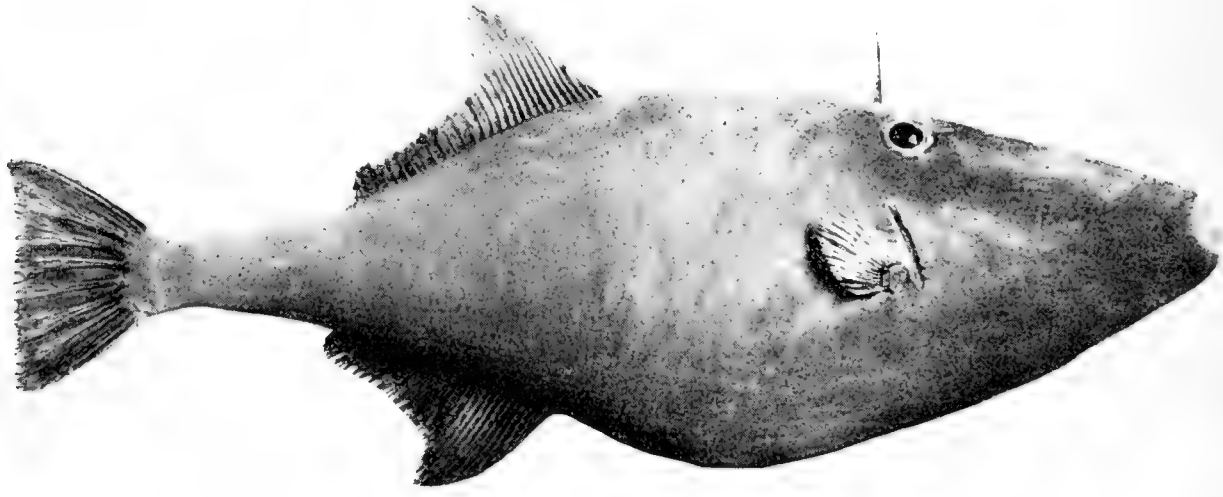

Fig. 308. *Cantherines ayraudi.*

Our largest and most important species, attaining a length of nearly 2 feet.

CANTHERINES VITTIGER Castelnau.

Monacanthus vittiger Cast., P.Z.S., Vict., ii, 1873, p. 81.

CANTHERINES GUNTHERI Macleay.

Monacanthus peronii Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 249 (not Holl.).
Monacanthus guntheri Macl. P.L.S., N.S.W., vi, 1881, p. 314.
Pseudomonacanthus guntheri Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.

CANTHERINES PERONII Hollard (Banded Leather-jacket).

Monacanthus peronii Holl., Ann. Sci. Nat. (4), ii, 1854, p. 356, pl. xiii, fig. 8; McCoy, Prod. Zool. Viet., dec. xv, 1887, pl. cxliii.

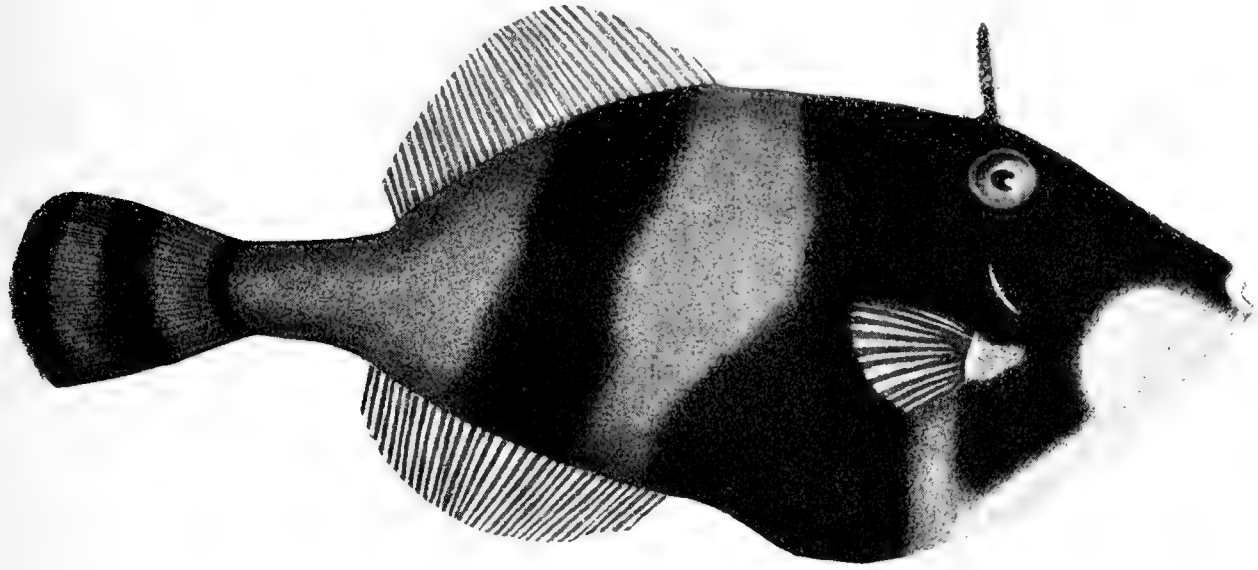

Fig. 311. *Cantherines peronii.*

CANTHERINES MULTIRADIATUS Günther.

Monacanthus multiradiatus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 248.

CANTHERINES SPILOMELANURUS Quoy & Gaimard (Bridled Leather-jacket).

Balistes spilomelanurus Quoy & Gaim., Voy. Uran. & Physic., 1824, p. 217.
Aleuterius paragaudatus Rich., Zool. Ereb. & Terr., 1846, p. 66, pl. xxxix, fig. 1-4.

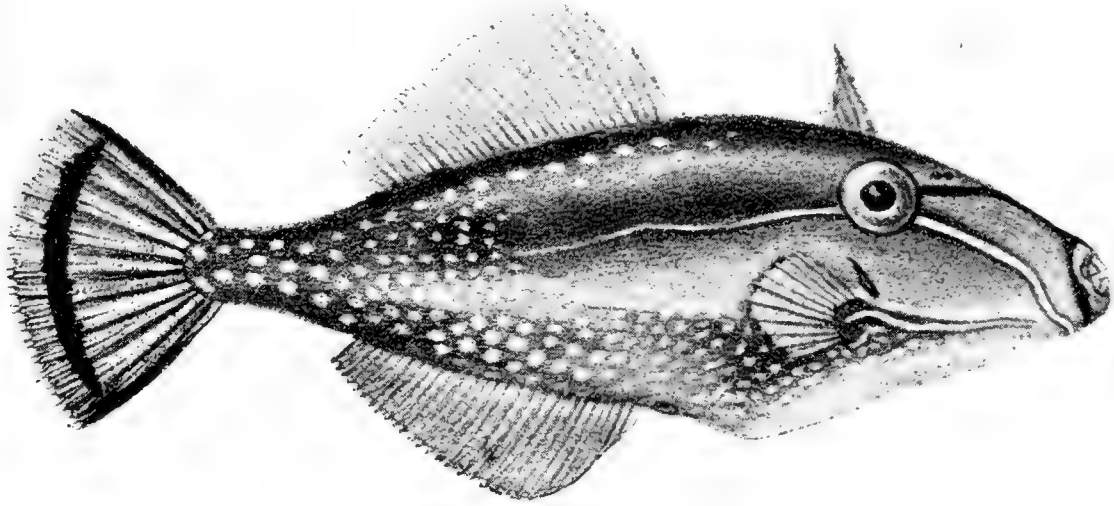

Fig. 313. *Cantherines spilomelanurus.*

Monacanthus spilomelanurus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 250.
Pseudomonacanthus spilomelanurus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.

CANTHERINES SETOSUS Waite (Velvet Leather-jacket).

Monacanthus setosus Waite, Mem. Aust. Mus., iv, 1899, p. 91, pl. xvi.
Pseudomonacanthus setosus Waite, Mem. N.S.W. Nat. Club., ii, 1904, p. 56.
Cantherines setosus Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 472, pl. xiv.

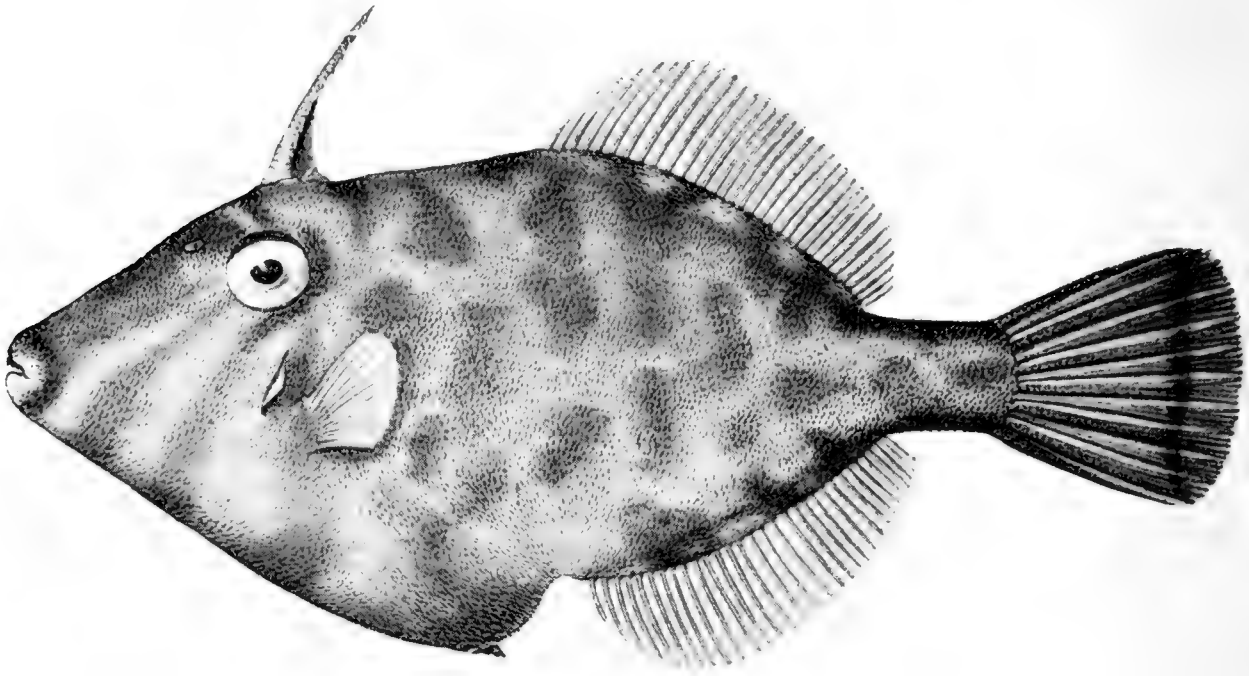

Fig. 314. *Cantherines setosus.*

The Leather-jackets are elsewhere called Trigger-fishes. The barbed spine can be locked erect; it can be released at will, or by the fisherman depressing the small second spine, which acts as a trigger.

CANTHERINES MOSAICUS Ramsay & Ogilby (Mosaic Leather-jacket).

Monacanthus mosaicus Rams. & Ogil., P.L.S., N.S.W. (2), i, 1886, p. 5; Waite, Mem. Aust. Mus., iv, 1899; p. 93, pl. xvii, fig. 1.
Pseudomonacanthus mosaicus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 56.
Cantherines mosaicus McCull., Endeavour Res., iii, 1915, p. 170, pl. xxxvii, fig. 1, 2

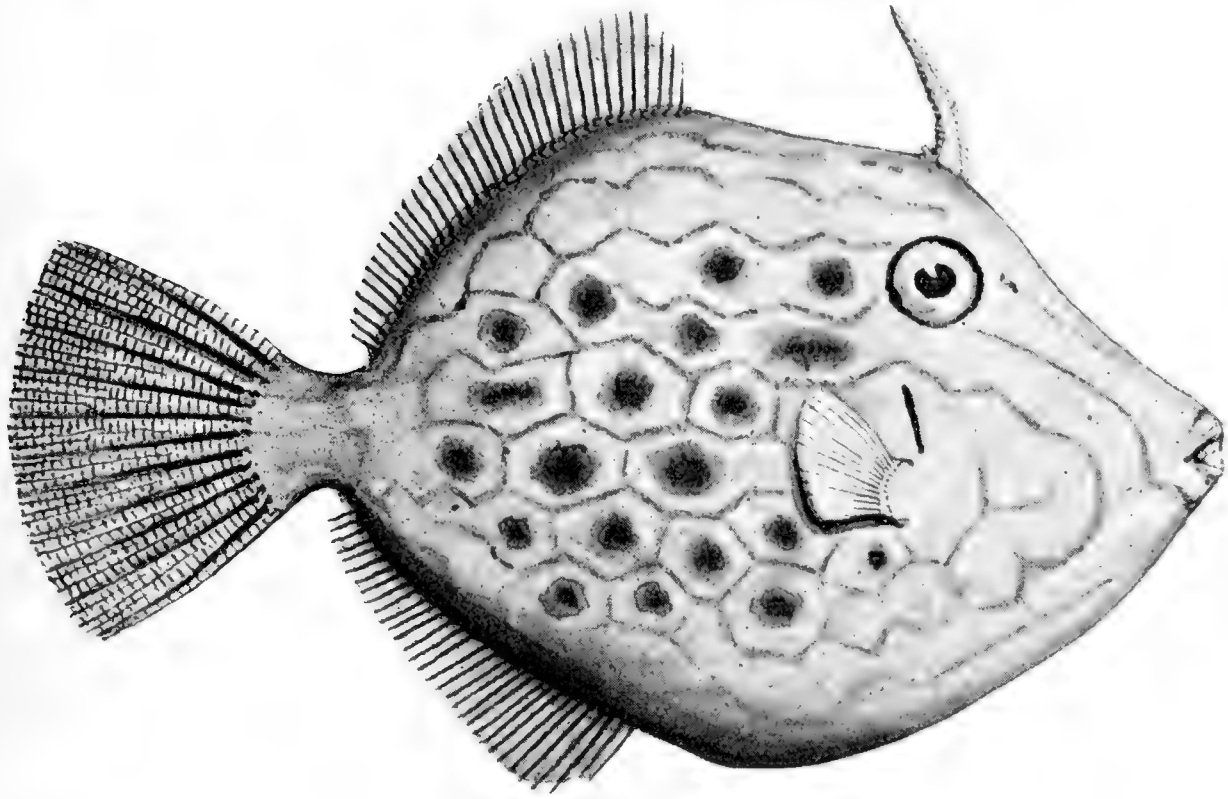

Fig. 315. *Cantherines mosaicus.*

The mosaic-like markings, whence the fish derives its name, are largely lost in adult life.

BRACHALUTERES Bleeker, 1866 (trossulus).

BRACHALUTERES TROSSULUS Richardson (Little Leather-jacket).

Aleuterius trossulus Rich., Zool. Ereb. & Terr., 1846, p. 68, pl. xl, fig. 5, 6; Holl., Ann. Sci. Nat. (4), iv, 1855, p. 6, pl. i, fig. 1.

Brachaluteres trossulus Bleek., Ned. Tyds. Dierk., iii, 1866, p. 13.

Monacanthus trossulus and *M. oculatus* Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 234, 235.

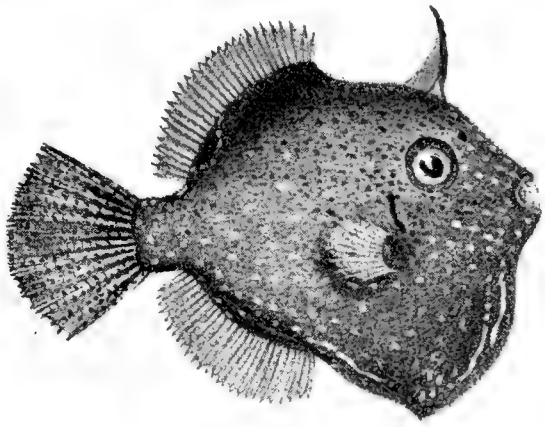

Fig. 316. *Brachaluteres trossulus.*

The figure represents the natural size of this species.

FAMILY OSTRACIONTIDAE.

OSTRACION Linnaeus, 1758 (cubicus=tuberculatum).

OSTRACION TUBERCULATUM Linnaeus (Box-fish).

Ostracion tuberculatus and *O. cubicus* Linn., Syst. Nat. (ed. x), 1758, p. 331, 332.
Ostracion cubicus Day, Fish. India, 1878, p. 696, pl. clxxxi, fig. 3 (syn.).

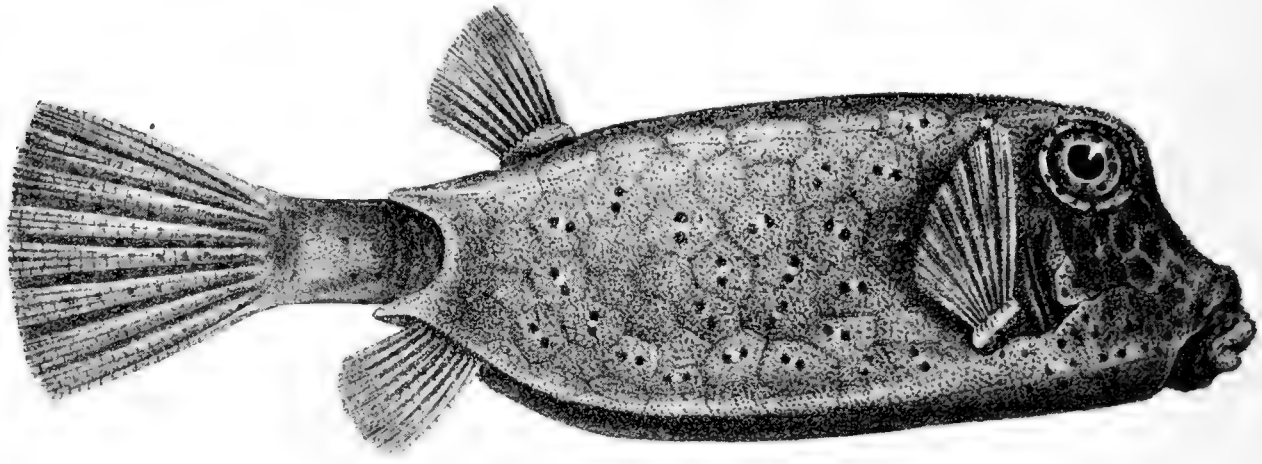

Fig. 317. *Ostracion tuberculatum.*

The scales are modified to form a rigid carapace; parts around the gill-openings and bases of the fins are exposed to permit of breathing and swimming.

CAPROPYGIA Kaup, 1855 (unistriata).

CAPROPYGIA UNISTRIATA Kaup.

Capropygia unistriata Kaup, Arch. f. Naturg., xxi, 1855, p. 220; McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 478, pl. xvi.

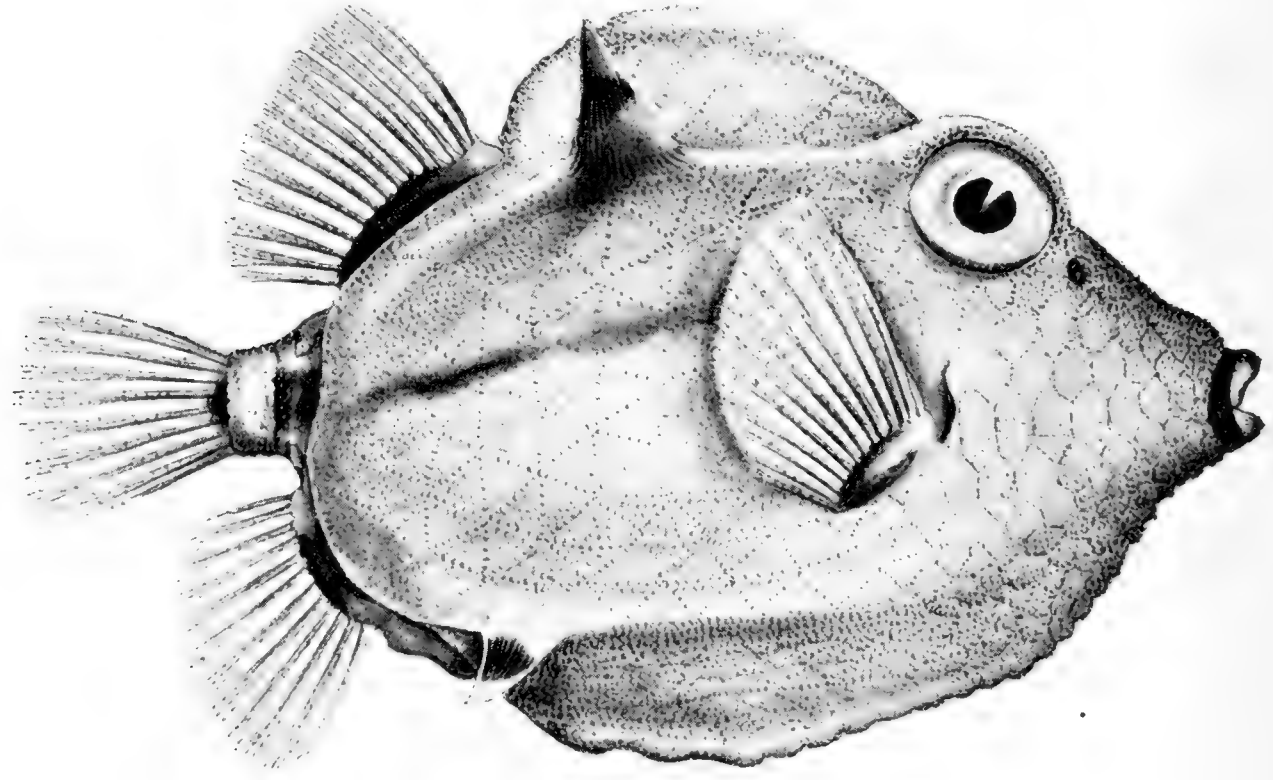

Fig. 318. *Capropygia unistriata.*

ANOPLOCAPROS Kaup, 1855 (grayi=lenticularis).

ANOPLOCAPROS LENTICULARIS Richardson.

Ostracion lenticularis Rich., P.Z.S., 1841, p. 21.

Anoplocapros lenticularis Kaup, Arch. f. Naturg., xxi, 1855, p. 221; McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 479, pl. xvii.

Anoplocapros grayi Kaup, *loc. cit.*

Aracana lenticularis Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 268; Waite, Mem. Aust. Mus., iv, 1899, p. 95, pl. xvii, fig. 2 and pl. xviii.

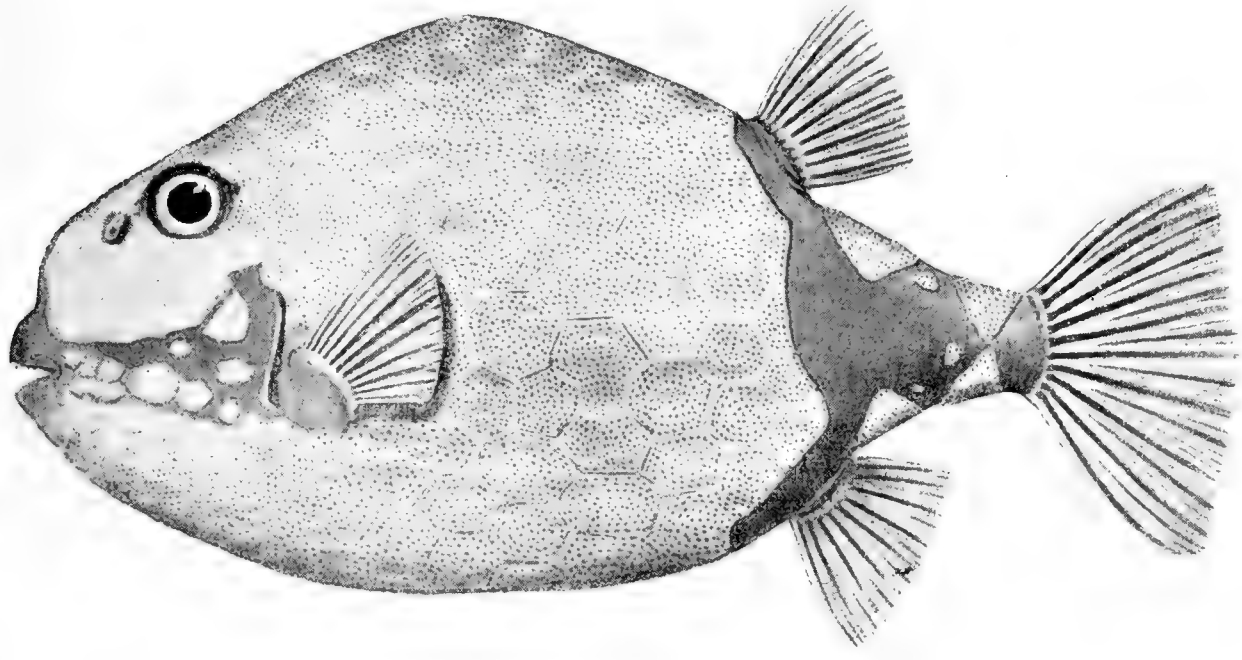

Fig. 319. *Anoplocapros lenticularis.*

ANOPLOCAPROS GIBBOSUS McCulloch & Waite.

Anoplocapros gibbosus McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 480, pl. xviii.

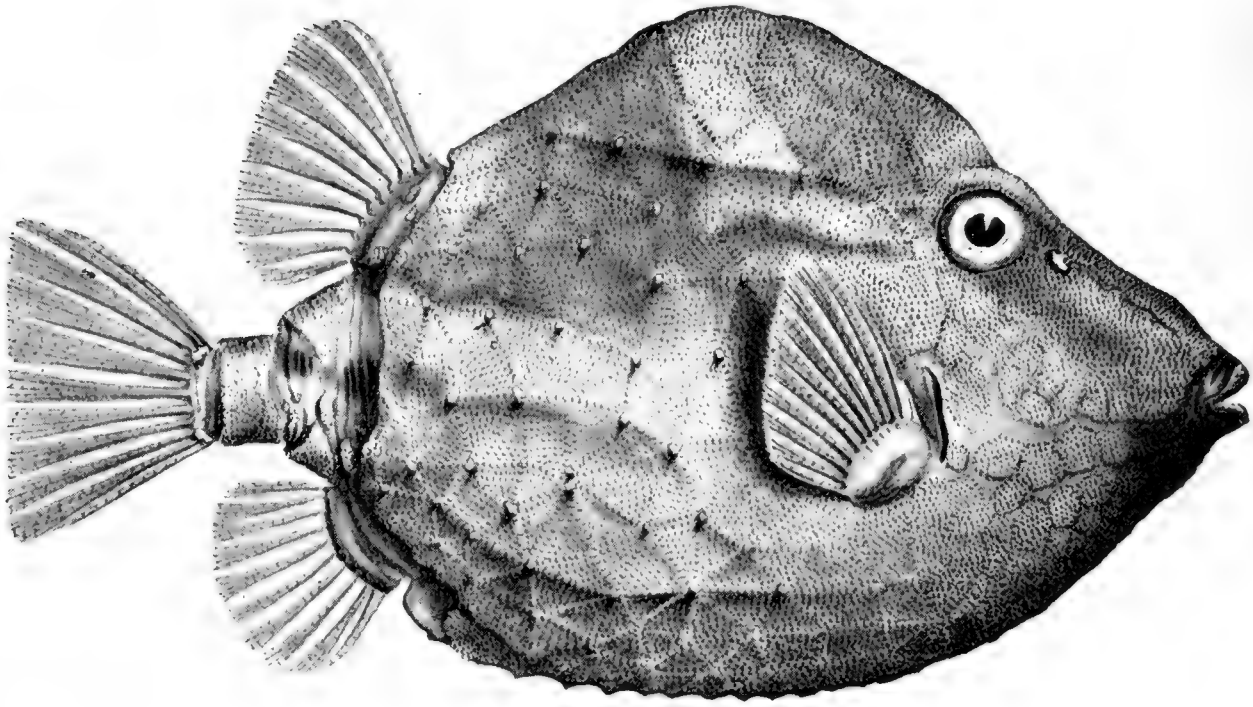

Fig. 320. *Anoplocapros gibbosus.*

ARACANA Gray, 1838 (ornata).

ARACANA ORNATA Gray (Common Cow-fish).

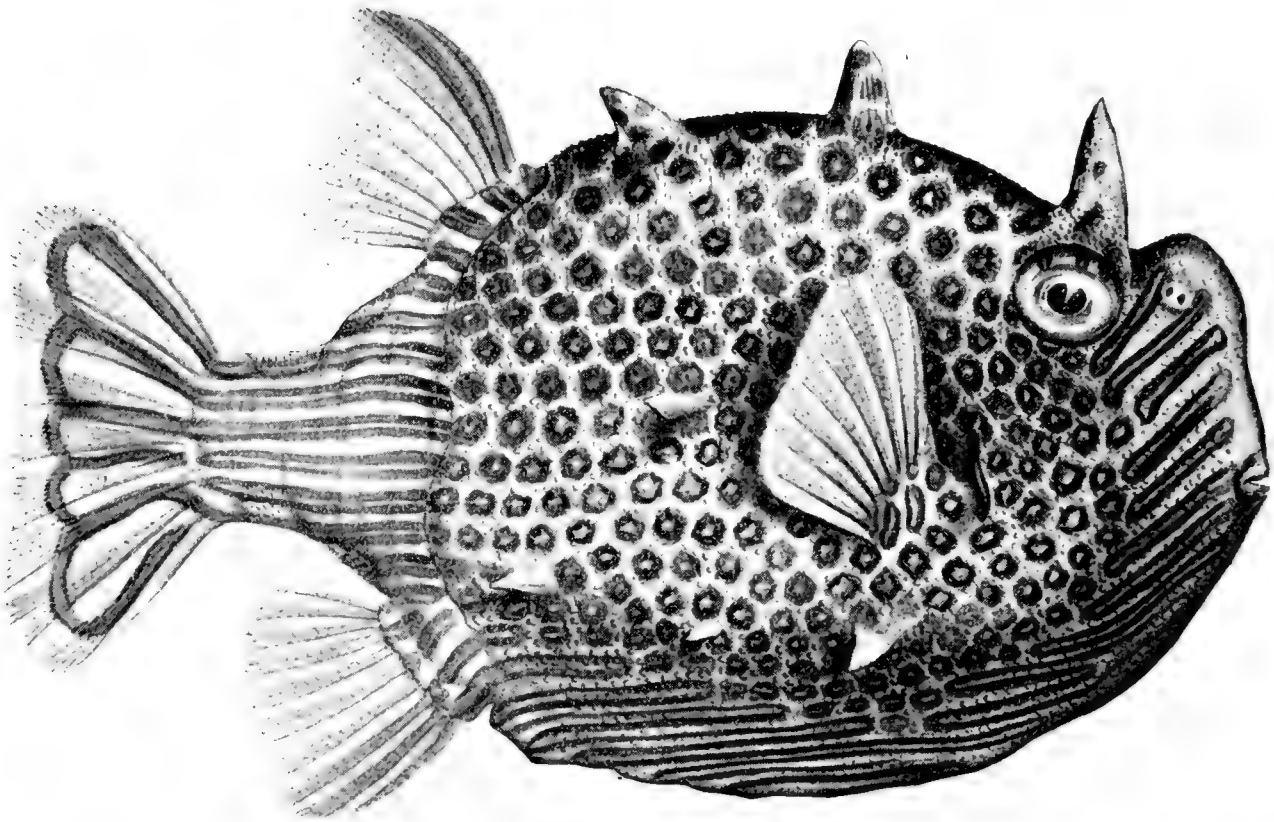

Fig. 321. *Aracana ornata.*

Aracana ornata Gray, A.M.N.H., i, 1838, p. 110; Rich., P.Z.S., 1840, p. 27 and T.Z.S., iii, 1849, p. 165, pl. x, fig. 2; McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 489, pl. xxiv.

Members of this genus differ from the other box fishes in having spines on the head, suggesting the horns of a cow.

ARACANA AURITA Shaw.

Ostracion auritus Shaw, Nat. Misc., ix, 1798, pl. cccxxxviii and Gen. Zool., v, 1804, p. 429, pl. clxxiii.

Aracana aurita Gray, Ill. Ind. Zool., 1829, pl. xcviii, fig. 2 and A.M.N.H., i, 1838, p. 110; Rich., P.Z.S., 1840, p. 27 and T.Z.S., iii, 1849, p. 160, pl. ix, fig. 1, 2; Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 46; McCull & Waite, T.R.S., S.A., xxxix, 1915, p. 484, pl. xx (syn.).

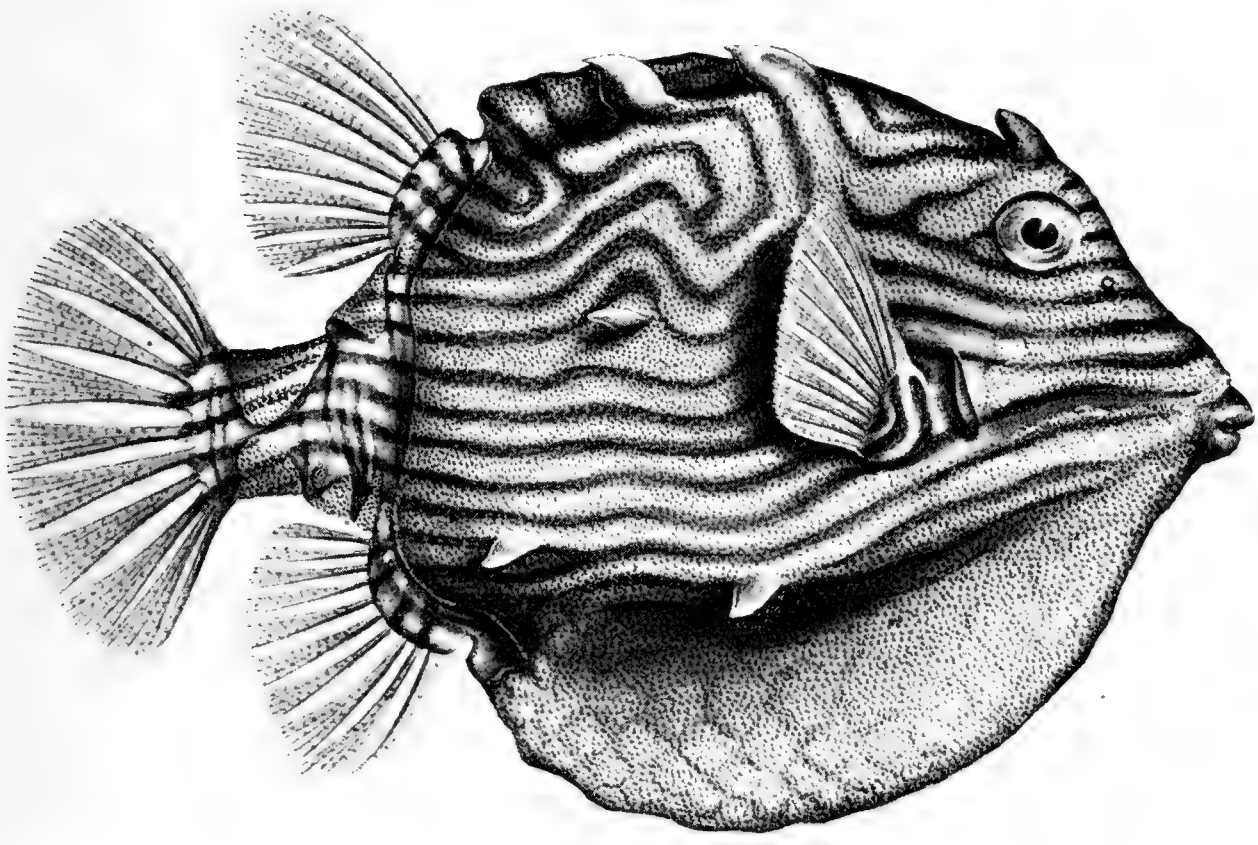

Fig. 322. *Aracana aurita.*

ARACANA SPILOGASTRA Richardson.

Aracana spilogaster Rich., P.Z.S., 1840, p. 27 and T.Z.S., iii, 1849, p. 163, pl. x, fig. 1; Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 47.
South Australian specimens are referred to a variety, as below.

var. ANGUSTA McCulloch & Waite.

Aracana spilogaster var. *angusta* McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 488, pl. xxiii.

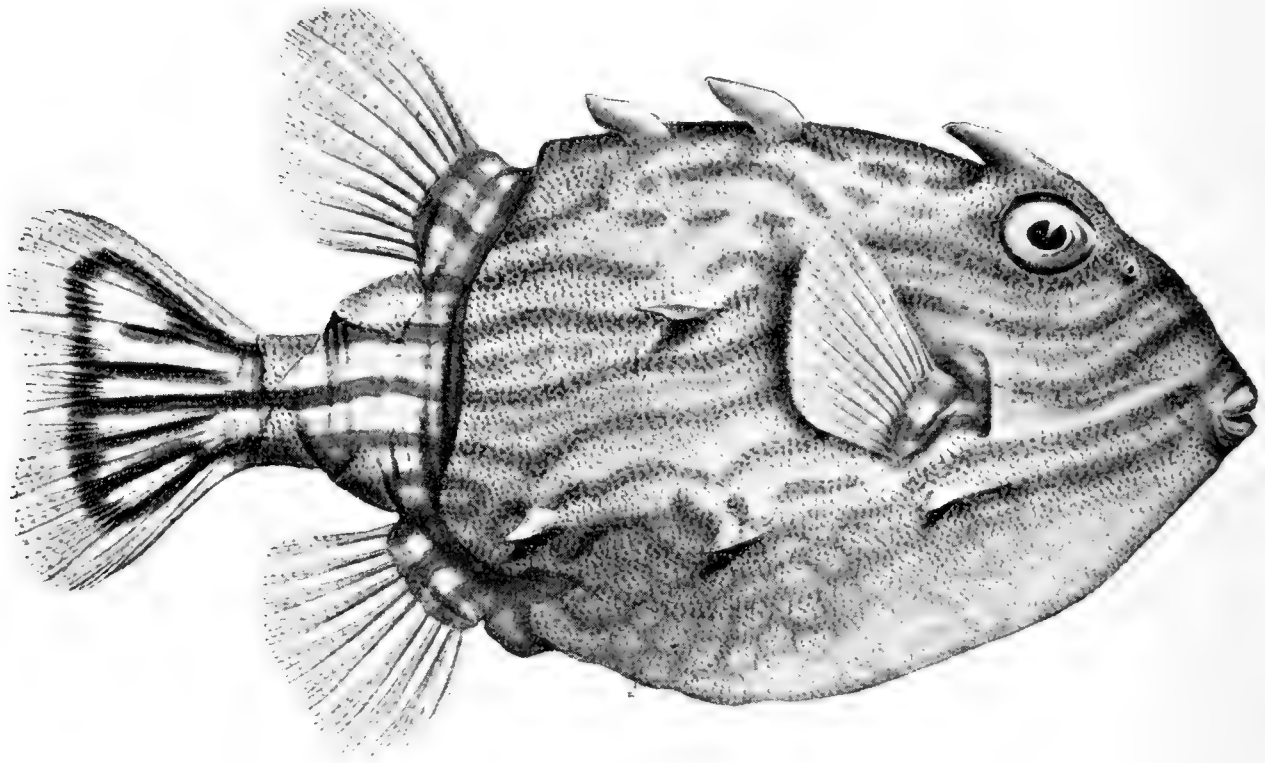

Fig. 323. *Aracana spilogastra*, var. *angusta*.

ARACANA FLAVIGASTRA Gray.

Aracana flavigaster Gray, A.M.N.H., i, 1838, p. 110; Rich., P.Z.S., 1840, p. 27 and T.Z.S., iii, 1849, p. 164, pl. xi, fig. 1; McCull. & Waite, T.R.S., S.A., xxxix, 1915, p. 491, p. xxv (syn.).

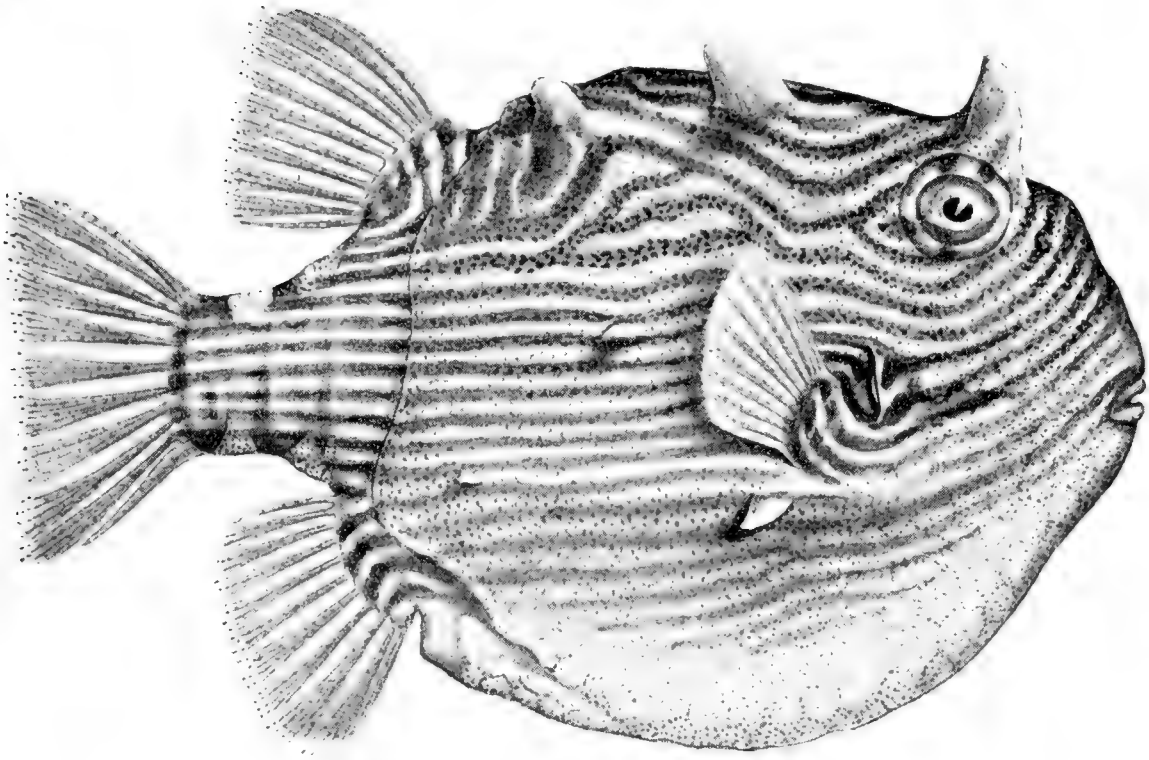

Fig. 324. *Aracana flavigastra.*

DIVISION GYMNODONTES.

FAMILY TETRAODONTIDAE.

TETRAODON Linnaeus, 1758 (testudineus).

TETRAODON TETRAGONUS Forster (Silver Toado).

Tetrodon tetragonus Forst., in Gmel., Syst. Nat. (ed. xiii), 1788, p. 1444.
Tetrodon sceleratus Gmel., *loc. cit.*
Tetrodon argenteus Lacep., Ann. Mus. Hist. Nat., 1804, p. 211, pl. lviii, fig. 2; Bleek., Atl. Ichth., v, 1865, p. 64, pl. ccix, fig. 1.

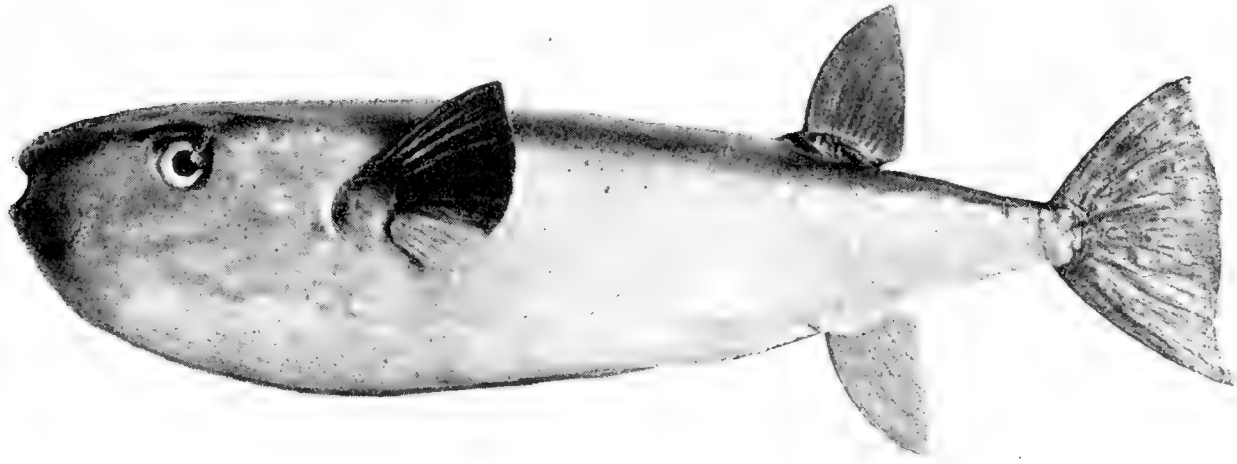

Fig. 325. *Tetraodon tetragonus.*

Tetrodon argyropleura Benn., Proc. Comm. Zool. Soc., ii, 1832, p. 184.
Spheroides sceleratus Jord. & Snyd., P.U.S. Nat. Mus., xxiv, 1901, p. 234 (syn.).

The Toados are not edible, and certain species are at times poisonous.

TETRAODON RICHEI Freminville (Common Toado).

Tetrodon richei Frem., Nouv. Bull. Philom., iii, 1813, p. 250, pl. iv, fig. 2.
Gastrophysus richei Bleek., Verh. Akad. Wetens. Amsterd., ii, 1855, p. 44, fig. 3.
Amblyrhynchotus richei Bibr., Rev. Zool., 1855, p. 280.
Spheroides richei Jord. & Snyd., P.U.S. Nat. Mus., xxiv, 1901, p. 248.

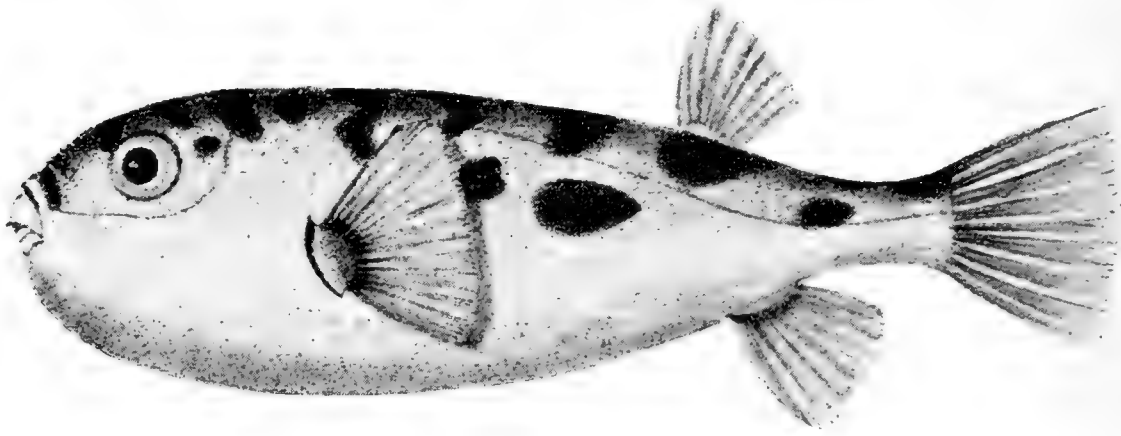

Fig. 326. *Tetraodon richei.*

The Tetraodons are elsewhere known as Puffers and Swell-fishes, names given in allusion to the habit of distending their bodies with water or air.

TETRAODON LIOSOMUS Regan.

Spheroides liosomus Regan, A.M.N.H. (8), iv, 1909, p. 439.

TETRAODON ARMILLA Waite & McCulloch (Ringed Toado).

Tetraodon armilla Waite & McCull., T.R.S., S.A., xxxix, 1915, p. 475, pl. xv.

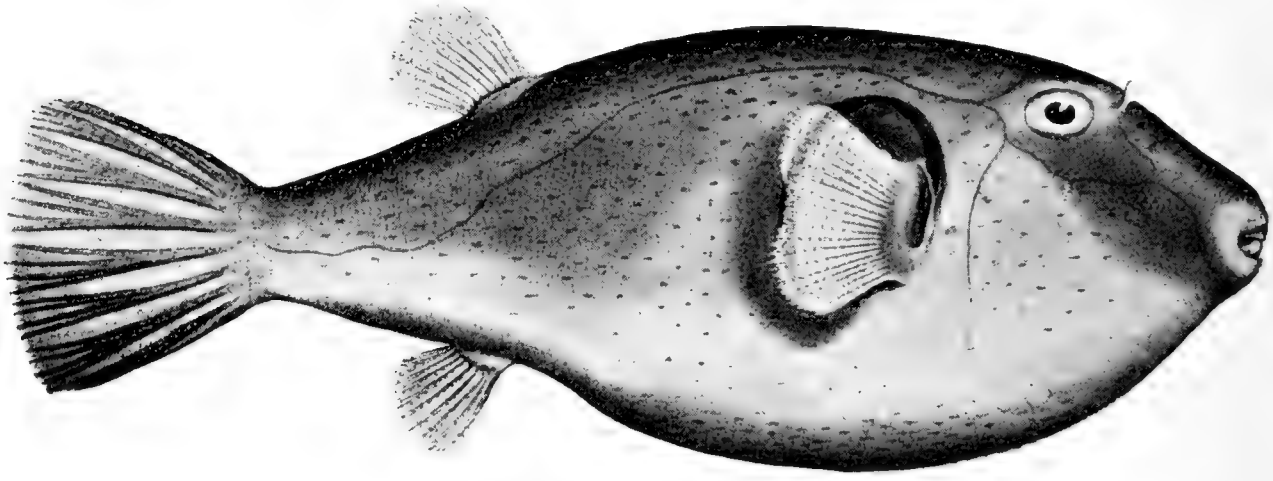

Fig. 328. *Tetraodon armilla.*

FAMILY DIODONTIDAE.

DIODON Linnaeus, 1758 (hystrix).

DIODON HOLOCANTHUS Linnaeus (Porcupine Fish).

Diodon holocanthus Linn., Syst. Nat. (ed. x), 1758, p. 335.
Diodon liturosus Shaw, Gen. Zool., v, 1806, p. 436.
Diodon spinosissimus, *D. novemmaculatus*, *D. sexmaculatus*, *D. multimaculatus* and *D. quadrimaculatus* Cuv., Mem. Mus. Hist. Nat., iv, 1818, p. 134..
Diodon melanopsis Kaup., Wiegm. Arch., 1855, p. 228.
Paradiodon novemmaculatus and *P. quadrimaculatus* Bleek., Atlas Ichth., v, 1865, p. 57, 58, pl. ccvi, fig. 3 and ccxii, fig. 2.
Diodon maculatus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 307.

CHILOMYCTERUS Bibron, 1846 (reticulatus).

CHILOMYCTERUS JACULIFERUS Cuvier (Javelin Fish).

Diodon jaculiferus Cuv., Mem. Mus. Hist. Nat., iv, 1818, p. 130, pl. vii.
Chilomycterus jaculiferus Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 313; Waite, Mem. Aust. Mus., iv, 1899, p. 98.
Dicotylichthys jaculiferus Waite, Mem. N.S.W. Nat. Club, ii, 1904, p. 58.

ATOPOMYCTERUS Bleeker, 1865 (nychthemerus).

ATOPOMYCTERUS NICHTHEMERUS Cuvier (Porcupine Fish).

Diodon nichthemerus Cuv., Mem. Mus. Hist. Nat., iv, 1818, p. 135, pl. vii, fig. 5; Bleek., Verh. Akad. Wetens. Amsterd., ii. 1855, p. 45.
Atopomycterus nychthemerus Bleek., Atlas Ichth., v, 1865, p. 49; Günth., Cat. Fish. Brit. Mus., viii, 1870, p. 315.

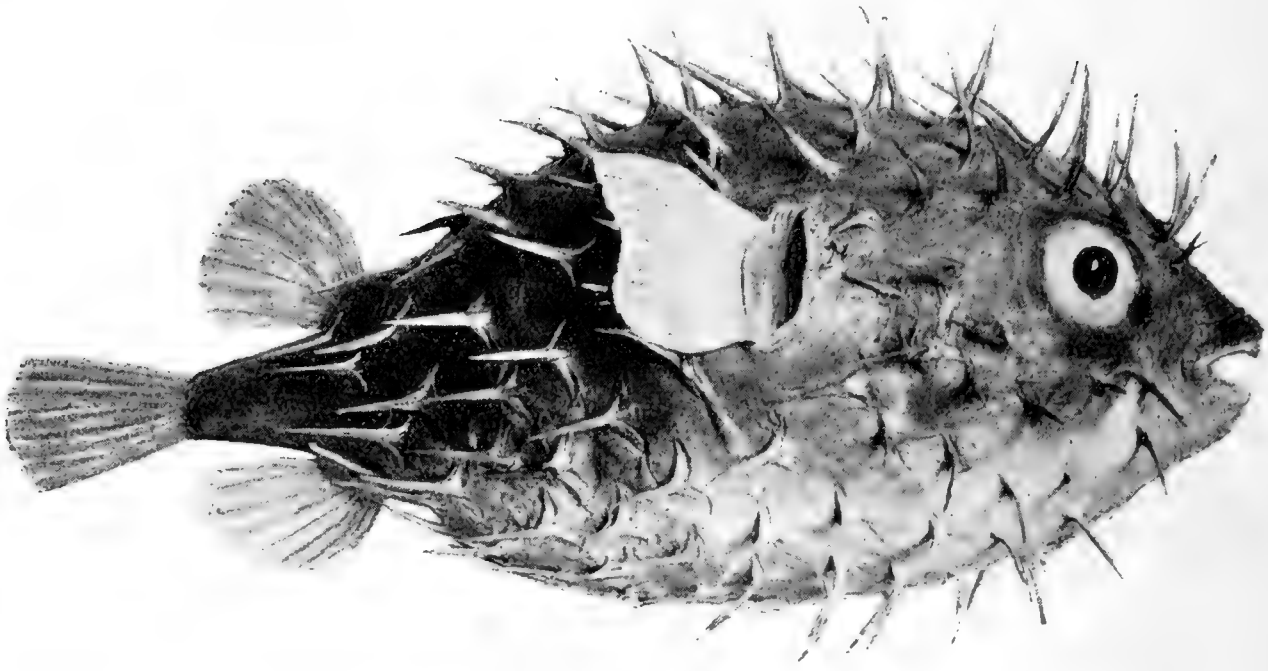

Fig. 331. *Atopomycterus nichthemerus.*

The names of the genera *Tetraodon* and *Diodon* are derived from the characters of the dentition, the teeth forming a beak, like that of a turtle. In the Tetraodons each jaw is divided in the middle, four teeth being thus produced: in the Diodons the beak is undivided.

FAMILY MOLIDAE.

MOLA Koelreuter, 1766 (aculeata=mola).

MOLA MOLA Linnaeus (Sunfish).

Tetraodon mola Linn., Syst. Nat. (ed. x), 1758, p. 334.
Mola aculeata Koelr., Nov. Comm. Acad. Petropol., x, 1766, p. 337, pl. viii, fig. 2, 3.
Mola mola Linck., Mag. Neues. Physik. u. Naturg., Gotha, 1790, p. 37; Jord. & Everm., Bull 47, U.S. Nat. Mus., ii, 1898, p. 1753 (syn.); Waite, Trans. N.Z. Inst., xlv, 1913, p. 223, pl. ix.
Orthragoriscus mola, Bl. & Schn., Syst. Ichth., 1801, p. 510.

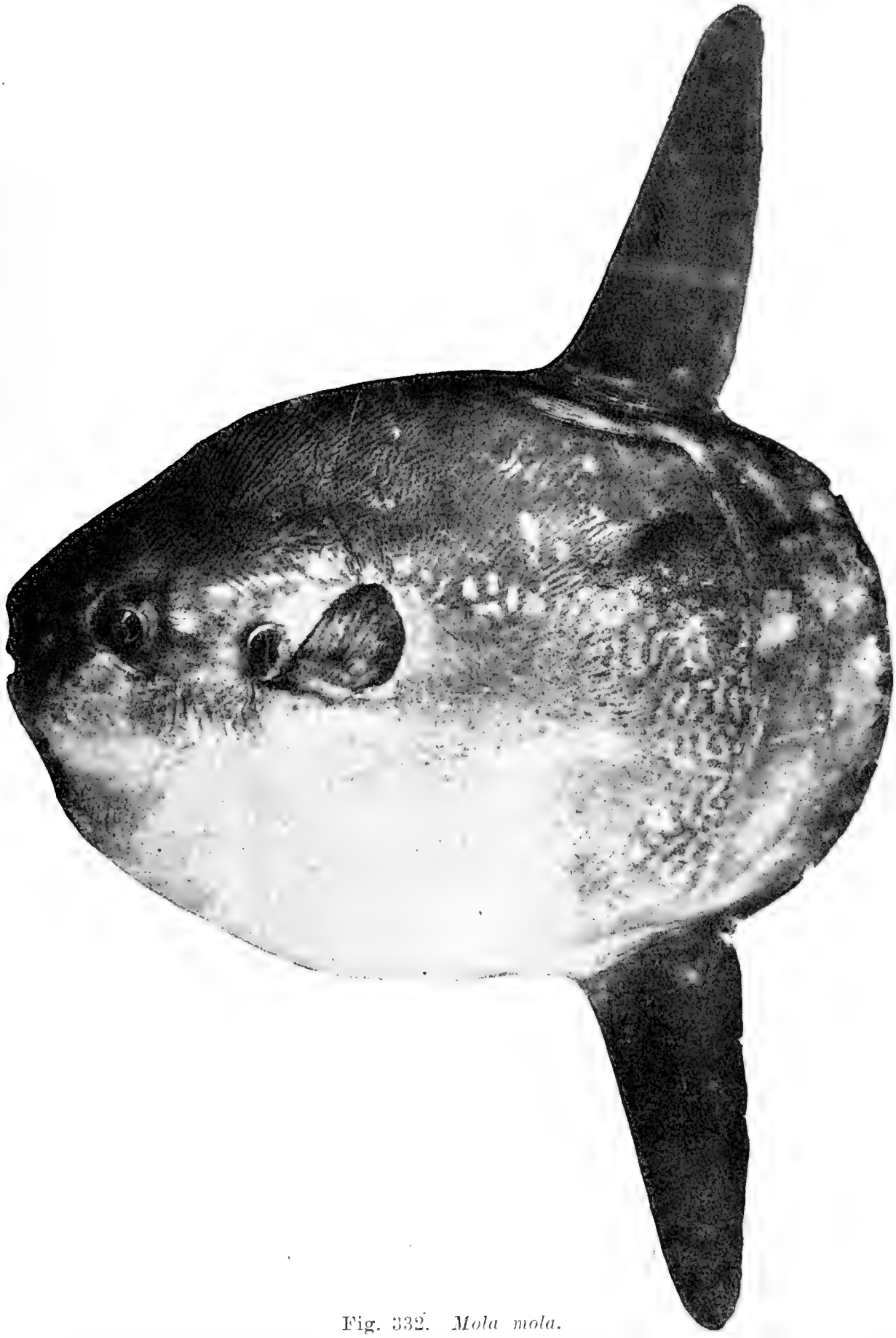

Fig. 332. *Mola mola.*

An enormous pelagic fish; examples have been taken weighing over 16 cwt.

Note. The majority of the illustrations are smaller than the adult fishes they represent: those numbered as follows are, however, larger than in nature:

Fig. 1, 55, 56, 62, 63, 78, 79, 80, 81, 84, 91, 94, 95, 118, 119, 121, 122, 123, 141, 150, 230, 233, 234, 235, 237, 240, 244, 251, 252, 253, 300, 301, 302, 304.

Corrections. Page 5, line 15, after *Cyclostomata* read *Plagiostomi.*
Page 46, line 2, for Family *Siluridae* read *Plotosidae.*

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TWO ZIPHIOID WHALES

NOT PREVIOUSLY RECORDED FROM SOUTH AUSTRALIA.

By EDGAR R. WAITE, F.L.S., DIRECTOR, S.A. MUSEUM.

Plates ii–iii.

1. MESOPLODON LAYARDII Gray.

Ziphius layardii Gray, Proc. Zool. Soc., 1865, p. 358, fig. a, b, c.

IT is generally conceded that of the species of *Mesoplodon*, the best characterized and best known is *M. layardii*.

It was, however, presumed familiarity with this species that led to its being passed over, when determination of a specimen, the subject of this note, was attempted.

First, looking at the teeth, they were seen to be small and flatly conical, with the ivory tip turned outwards and downwards in a most extraordinary manner: knowing nothing approaching this condition, other features, both of skull and vertebrae, were then investigated, but without satisfactory results. Then the solution flashes across the mind: the teeth were those of an immature *M. layardii*, the "apex" being the anterior edge of the summit of the future "strap," and the hinder corner the posterior margin of the summit. When once the condition was realized, confirmation was forthcoming. Krefft and Gray published an illustration of an almost identical tooth, but failing to realize its connection with the Strap-toothed Whale, described it as the type of a new genus and species. (1) The figure, however, scarcely does justice to the condition as seen in our example, of which reproductions from actual photographs are supplied. The description, by Turner, of another tooth will be referred to later. Advantage has been taken of the opportunity to give some general notes on the animal and its skeleton.

The whale was cast up on the beach near Kingston, in Lacepede Bay, in February 1919, its occurrence being reported by Mr. Norman B. Tindale. It was some time later before I was able to visit the scene, by which time the softening flesh had settled down, so that any hope that had been entertained of casting the animal was out of the question, Mr. R. Limb, the Museum Formator, having accompanied me with that end in view. The carcase had been somewhat mutilated, as usual in such cases, by visitors, but the pair of divergent throat grooves was appar-

(1) Krefft & Gray, Ann. Mag. Nat. Hist. (4), vii, 1871, p. 368, fig.

ent. The colour, after the results of partial decomposition, was black above and somewhat lighter below, but in its then condition it supplied no indication of the markings of the species, as previously described and figured by me. (2) The two mandibular teeth did not seem to have erupted the gums, and were not found until searched for by cutting into the flesh. Unsuccessful search was made for the smaller teeth found embedded in the gums of some of the Ziphioid whales. During an adjournment made while securing the skeleton, the carcase was visited by gulls and portions of flesh carried off: pelvic bones, if present, were probably lost by such means, as no trace of them could be found; the suborbitals had also disappeared. The otherwise complete skeleton was taken to Adelaide and mounted by the Museum taxidermists, Messrs. O. and J. Rau. I am indebted to Mr. H. M. Hale for the photographs accompanying the paper.

The following measurements were made as the animal lay on the beach:

	ft.	in.	mm.
Total length to middle of tail flukes	15	3	4648
Tip of snout to eye	2	3	686
Tip of mandible to vent	10	2	3099
Tip of snout to origin of dorsal fin	9	6	2895
Width of tail flukes	3	2	965

The specimen was a male, and, as afterwards transpired, a relatively young example, a fact supported by the following observations:

The small size, 15 ft. 3 in., as against 19 ft. 2 in., the maximum recorded.

The general soft condition of the bones, which necessitated careful maceration.

The open sutures and unattached epiphysises of the bones, especially of the vertebrae.

The imperfectly developed teeth, and the absence of a bony mesorostral; a basal soft bony mesethmoid being, however, evident.

Skull. The skull is generally symmetrically formed, the anterior narial portion alone being twisted towards the left side. The lateral groove at the basal portion of the rostral, generally described as only slightly developed in the species, is quite a feature in this young example, but possibly becomes less pronounced as development proceeds; the posterior pit in which the groove terminates is shallow. The foramina for the exit of the branches of the 5th nerve lie in the same transverse line. Other characters of the skull may be ascertained from the accompanying photographs and following table of dimensions, made in accordance with Flower's measurements (3):

(2) Waite, Rec. Cant. Mus., i, 1912, p. 326, pl. lxii.

(3) Flower, Trans. Zool. Soc., x, 1879, p. 424.

	mm.
Extreme length of cranium	853
Length of rostrum (from the apex of the premaxilla to the middle of a line drawn between the anteorbital notches)	574
From middle of hinder edge of palate (formed by the pterygoids) to apex of rostrum	678
Greatest height of cranium from vertex to pterygoids	338
Breadth of cranium across superior margin of orbits	328
Breadth of cranium between zygomatic processes of squamosals	256
Breadth between anteorbital notches	197
Breadth of middle of rostrum	68
Breadth of occipital condyles	115
Premaxillae, greatest width behind anterior nares	156
„ least width opposite anterior nares	110
„ greatest width in front of anterior nares	111
Width of anterior nares	50
Length of tympanic bone	44
Greatest breadth of tympanic bone	30
Mandible, length of ramus	742
„ length of symphysis	166
„ greatest vertical height of ramus	113

The skull has been well figured by others, but I have not seen a truly anterior aspect illustrated. This is supplied in the accompanying photograph (fig. 2) and shows the peculiar deflection of the teeth from the axes of the snout. The illustration stated by Turner to be a front view of the skull is really an upper view.

Teeth. The teeth originate at the hinder part of the mandibular symphysis, but as during growth they are inclined strongly backwards they appear to have a still more posterior origin, an appearance increased by the fact that the apices approximate immediately before the frontal portion of the head. The teeth are band-like, the breadth of the band lying generally in the axis of the skull. In aged examples, as has been often stated, the teeth meet, or even cross (4) and limit the gape of the mouth, so that the method of feeding becomes a problem. It is, however, with the juvenile tooth that we are more nearly concerned. The shape of that supplied by the animal now under consideration is shown in the accompanying figure (fig. 6), the longer portion of the growing root being

(4) Sutton, Proc. Zool. Soc., 1885, p. 440, fig. 7, 8.

directed forwards: the tooth is set so that at first it grows very divergently in relation to its fellow, thus well clearing the sides of the snout; the summits then converge, and finally meet or cross as mentioned. An early function of the ivory tip may be to cut the gum, which would, apparently, be opened on the outer side; were the function of the tip to end there, we might suppose that it would drop off, much as does the thorn on the beak of an embryo chick. When, during the growth of the tooth, the summit begins to curve obliquely over the snout, the tip of the tooth tends to assume a more erect position, until finally it becomes subvertical. The successive deposits of tooth matter at the root are well seen in the teeth in question, as shown in the figure, and are also illustrated in the drawing of Krefft and Gray.

Turner (5) gives a most exhaustive account of a young tooth—younger than the one here described—from which it would appear that it is not until a slightly later development that the enamel tip or denticle takes on a downward position. He describes the denticle as projecting outwards and slightly upwards; that is, of course, in relation to the shaft, fang, or strap, and is true when the shaft is but quite small, as in the "Challenger" example (fig. 15 and 16). As, however, the shaft grows in an outward curve the denticle becomes more and more deflected from the plane of the shaft, until the latter begins to grow straight, whence the curvature is changed, the strap curving inwards and ultimately over the beak, when, as before stated, the denticle assumes an erect position in relation to the vertical axis of the skull. The downward aspect of the denticle in a tooth of the age of that of the Kingston whale, when in position in the jaw, is relatively greater than when held with the shaft in a vertical position, because the direction of the root of the growing tooth, conforming to the slope of the mandible, is markedly outward. Turner states that the denticle projects from about the middle of the upper border of the fang. This is apparently correct only for a very young tooth, for what is the middle of the fang in a young example afterwards becomes the anterior apical corner of the strap. The angle at which the denticle projects after cutting the gum is thus indicated by the writer quoted: "It is set at such an angle to the shaft as to be directed away from the animal's snout, and towards the water in which it swims." Seeing that the whale may be presumed to be wholly immersed in water, this description is not very lucid; it was doubtless intended to convey the information that the denticle was directed horizontally. In our tooth, the direction when *in situ* is almost directly downwards. In Turner's figure 15, the tooth is illustrated as inclined backwards above, apparently to show the condition of the base, the "set" of the denticle being indicated in figure 16.

(5) Turner, "Challenger" Report, i, Bones of Cetacea, 1880, p. 10, pl. ii, fig. 15, 16.

Vertebrae, Ribs etc. The number of vertebrae is as follows: Cervical 7, Dorsal 9, Lumbar 10, Caudal 20, the terminal nine being without processes. The first three cervicals are connected. The number of dorsals is generally set down as ten, in our specimen nine only possess articulations for the ribs, and we have but nine pairs of ribs; they were all certainly recovered. The first seven dorsal vertebrae bear zygapophyses. The lumbars are keeled below. The caudals are generally stated to be 19, we have 20; the total number of bones in the column is 46, thus agreeing with that assigned by others, the individual differences occurring in the relative counts of the dorsals and caudals.

The first perforated diapophysis is the 8th caudal: there are 11 chevrons, the first of which is composed of two separate bones.

M. layardii has a wide distribution in southern seas; in Australasia it is recorded from New Zealand and the Chatham Islands, Queensland, New South Wales, and now South Australia. It was originally described from Capetown, and the "Challenger" obtained it at the Falkland Islands.

2. MESOPLODON GRAYI Haast.

Mesoplodon (Oulodon) grayi Haast, Proc. Zool. Soc., 1876, p. 7 and 457.

The subject upon which the identification rests is the right mandibular ramus of a specimen found on the beach at Kingscote, Kangaroo Island, and forwarded to the Museum on April 26, 1910, by Mr. A. H. Anderson, Harbour Master. It was generically identified by Mr. F. R. Zietz and labelled "*Mesoplodon*, sp.?"

The tooth was *in situ* when found, but someone cut the bone away on the outside and the tooth can now be removed and replaced. It can be inserted on either face, but as it *fits* only in one of the two positions, the conditions as below described are assumed to be correct. The tip of the mandible is missing, so that no useful comparative dimensions can be supplied; the symphysial connection appears to have been unossified, excepting perhaps in its anterior portion; the tooth stands at the hinder part of the juncture, its greater portion being in advance of the posterior connection of the symphysis. It is erect in the jaw, but the general curve, in which the enamel portion or denticle participates, is gently inwards, and the extreme tip, for about 1 mm., is curved outwards. When removed from the jaw, the shape presented is that of a flattened cone, suddenly expanded below at about half its height, with the basal margin strongly bowed; if inverted and the denticular portion held between finger and thumb, the resemblance to some of the flabelliform corals is very striking. The tooth is hollow, the denticle included: the latter occupies about one-fourth the total height, and its sides all round pass evenly into the contour of the base.

The fact that such a small portion of the animal is available for examination renders determination somewhat uncertain, but a study of the literature seems to indicate that the ramus should be assigned to *Mesoplodon grayi* Haast. As the

tooth was undoubtedly functional, and as that of the female of the species is smaller and said not to cut the gum, the mandible under examination may be regarded as that of a male.

The jaw and tooth are illustrated on plate iii, fig. 7 and 8.

It is this species in which the presence of small teeth in the upper jaw of both sexes was demonstrated by von Haast.

This whale has been freely stranded on the Chatham Islands, and examples are also known from New Zealand and Patagonia. It is listed by Ogilby as from New South Wales, but has not been previously recorded from South Australia.

PRINCIPAL REFERENCES.

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Mesoplodon layardii Gray.

Mesoplodon layardi Flower, T.Z.S., viii, 1874, p. 211 and x, 1878, p. 416; Hector, T.N.Z. Inst., x, 1878, p. 341; Turner, Chall., Rep. i, 1880, p. 2-26, pl. i-iii; De Vis (Jaggard), P.R.S., Queensl., i, 1884, p. 58, and 1885, p. 174, pl. xix; Flower, List Cetacea, Brit. Mus., 1885, p. 11; Sutton, P.Z.S., 1885, p. 440, fig. 7, 8; Trimen, T.S.Afr. Phil, Soc., v, 1893, p. 295; Trouessart, Cat. Mamm., ii, 1898, p. 1067; Selater, Mamm. S. Afr., ii, 1901, p. 193, fig. 144; Waite, Rec. Cant. Mus., i, 1907, p. 326, pl. lxii; FitzSimons, Nature, July, 1907, p. 247, fig. 1, 2, and Knowledge, August, 1907, p. 173 and figs.

Mesoplodon thomsoni, Krefft, MS. in Ogil. Cat. Aust. Mamm., 1892, p. 71.

Mesoplodon grayi Haast.

Mesoplodon bidens Ven Ben., Mem. Cour. Acad. Belgique, 1888 (*fide* Trouessart).

Explanation of Plate ii.

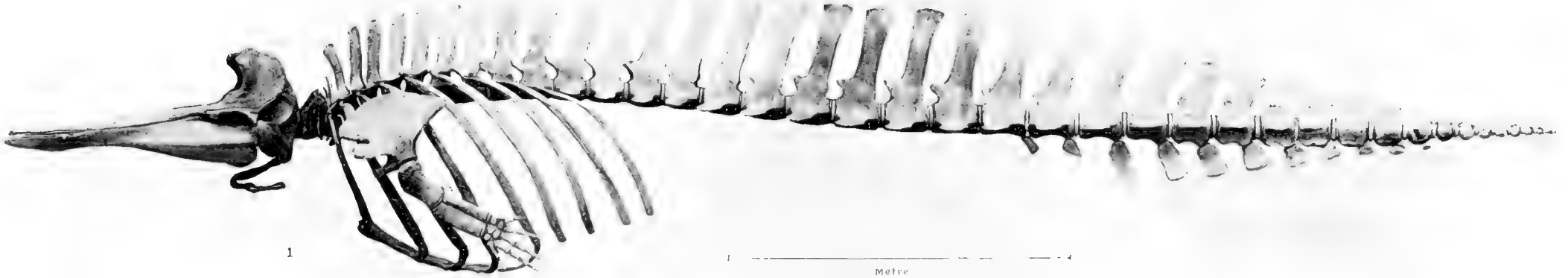
Fig. 1. Skeleton of *Mesoplodon layardii* Gray (one-tenth natural size).

Explanation of Plate iii.

Fig. 2. Skull of *Mesoplodon layardii* Gray, from the front, showing the disposition of the mandibular teeth (one-sixth natural size).
Fig. 3. Skull, from behind (one-sixth natural size).
Fig. 4. Skull, from above (one-eighth natural size).
Fig. 5. Skull, from below (one-eighth natural size).
Fig. 6. Tooth of left ramus, outside aspect (five-sevenths natural size).
Fig. 7. Right ramus of mandible of *Mesoplodon grayi* Haast (one sixth nat. size).
Fig. 8. Tooth (five-sevenths natural size).

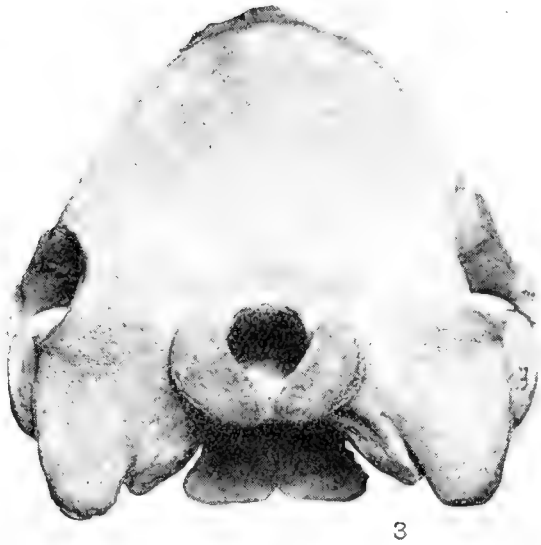
Metre.

rdii Gray.)



BEAKED WHALE (Mesoplodon layardii Gray.)

2



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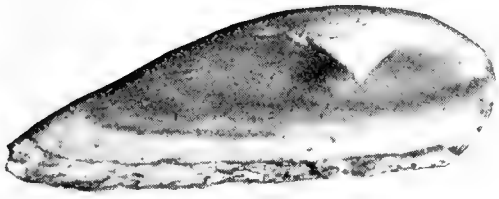

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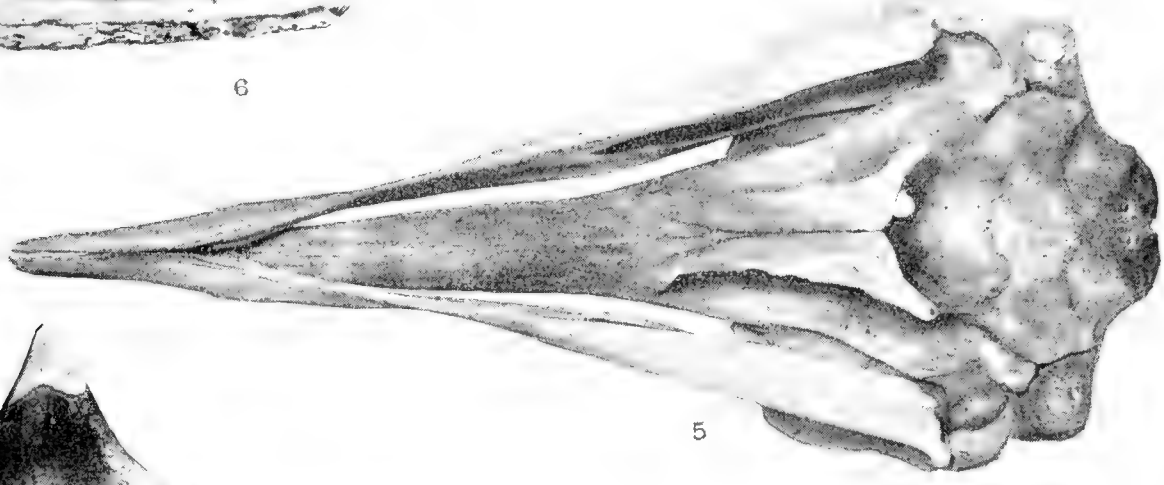

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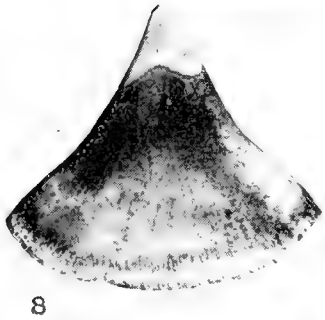


8

7

BEAKED WHALES

DESCRIPTION OF A NEW AUSTRALIAN FISH OF THE GENUS CONGIOPUS.

By EDGAR R. WAITE, F.L.S., DIRECTOR, S.A. MUSEUM.

Fig. 333.

THE genus *Congiopus* was founded by Perry, with *C. percatus* as type; its status being as below:

Congiopus Perry, Arcana or Mus. of Nat. Hist., 1811.
Agriopus Cuvier, Reg. Anim. (ed. 2), ii, 1829, p. 168.
Cephalinus Gronow, Cat. Fish, Brit. Mus. (ed. Gray), 1854, p. 159.
Congiopodus Gill, Mem. Nat. Acad. Sci. Wash., vi, 1893, p. 118.

I am unable to consult Perry's work, part of which appears to have been issued in 1810 and part in 1811. Marschall (1) does not seem to have seen the "Arcana," but lists the genus under the form *Congiopodus;* this mis-spelling and the erroneous date (1871) have been copied by most subsequent authors.

Cuvier was aware of Perry's paper, as noted in the "Histoire." (2)

In his "Genera of Fishes" (3) Jordan erroneously credits the editorship of Gronow's work to Albert Günther.

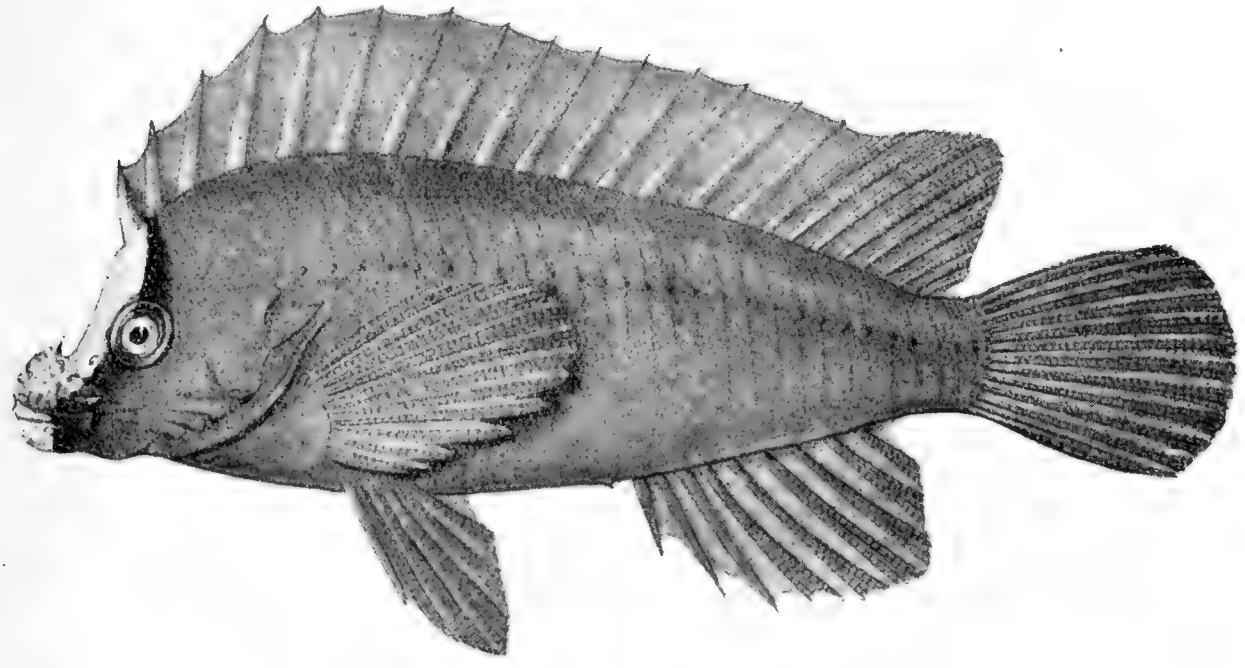


Fig. 333. *Congiopus leucometopon.*

(1) Marschall, Nomencl. Zool., 1873, p. 71.
(2) Cuv. & Val., Hist. Nat. Poiss., iv, 1829, p. 382, footnote.
(3) Jordan, Genera of Fishes, ii, 1919, p. 258.

Several species of the genus *Congiopus (Agriopus)* have been described from Chilian, South African, and Australian seas, but hitherto one only has been recognized from our waters. This (*C. leucopaecilus* Rich.) is known from South Australia and King George Sound, Southern Western Australia. A second Australian species is described as follows:

CONGIOPUS LEUCOMETOPON sp. nov.

D. xv, 9; A. iii, 6 (7); V. i, 5; P. 12 (11); C. 14.

Length of head 2·9, height of body 3·0, and length of caudal 3·6 in the length. Diameter of eye 4·8, interorbital space 6·1, and length of snout 3·0 in the head.

Head compressed, narrowed suddenly to the base of the snout, anterior profile very steep, snout bulbous and rugose, with a pair of short spines above directed upwards and backwards, and another on each side above the expanded distal end of the maxilla; mouth slightly oblique, the chin roughened like the snout, jaws equal; the maxilla does not reach the verticle of the eye. Four blunt processes on the margin of the preopercle and a weak flat spine imbedded on the opercular flap. The posterior nostril is on a level with, but in advance of, the lower edge of the eye; the anterior nostril is on a lower level. Gills four, no slit behind the last. Small pseudobranchiae present.

Teeth. Those in the jaws set in broad bands, each of which has a median suture, a triangular patch on the vomer, none on the palatines or tongue.

Fins. The first dorsal spine stands over the middle of the eye, the following ones are successively longer to the fourth, thence subequal, the longest being about half the length of the head; the soft rays form a lobe, higher than the spinous portion, the middle rays being 1·5 in the length of the head. The anal spines are strong, the third being equal in length to that of the longest dorsal, those of both fins are normally hidden in the membranes; the soft rays form a lobe similar to that of the dorsal; the hinder insertion of the fin is forward of that of the dorsal. The pectorals are large, extending to nearly above the first spine of the anal, with a broad base, the rays of the lower half with free tips. Ventrals pointed, extending to the vent and nearly as far as the pectorals, the spine strong. Caudal rounded. its peduncle compressed, the depth being one-third the height of the body.

Body compressed, naked, with vertical pliae or crease-like marks, each line passing through one of the lateral pores; the latter arise in advance of the opercular flap, and pass, with a lower curve than the dorsal profile, to the middle of the caudal peduncle; there are 28-30 pores in the series. The vertical marks were not apparent in the fresh specimen, but appeared after immersion in the

preservative; they are indicated in the drawing. A minute post-anal papilla is present.

Colours. Forehead, including the first dorsal spine, the front of the snout and tip of the chin white. This is followed by a jet black band, which arises narrowly at the base of the second spine, broadens, and passes obliquely through the eye across the hinder half of the snout, encircling the lower jaw behind the chin. The rest of the head, body, and fins are of deep coffee colour.

Locality etc. Described from two specimens, of which the smaller is marked as the type. The variation in the number of rays enclosed within brackets refers to the larger specimen; this measures 160 mm. in length, and was collected on the beach at Glenelg, South Australia, after a severe storm, by members of the Museum staff. The type, which measures 130 mm. in length, was taken at the same place and under similar conditions by Mr. H. M. Cooper. Type, No. F. 455.

This species differs from all other described members of the genus by having three spines in the anal fin. Many writers would regard this as justifying the erection of a new genus, and I shall be quite prepared to learn of the species being so erected. The number of genera constituted nowadays is overwhelming, and the practice must sooner or later fall under the weight of the burden cast upon it. One of the negative characters ascribed to the genus is the absence of preorbital spines, yet in *C. granulatus* from the Cape, three rough preorbital spines are described. Jordan and Starks (4) contrast their *Ocosia* with *Agriopus* and apparently inadvertently state that it differs therefrom in lacking the preopercular spine. In the description of the species *O. vespa*, they describe the maxillary as reaching to below the middle of the eye, a statement at variance with the figure. This species agrees with *C. leucometopon* in having three anal spines, but its general alliance appears to be with *Tetraroge* rather than with *Congiopus*.

(4) Jordan & Starks, Proc. U.S. Nat. Mus., xxvii, 1904, p. 162, fig. 17.

STUDIES IN AUSTRALIAN SHARKS, No. 4.*

By EDGAR R. WAITE, F.L.S. Director, S.A. Museum.

Fig. 334.

PARASCYLLIUM FERRUGINEUM McCulloch.

Parascyllium ferrugineum McCull., Endeavour Res., i, 1911, p. 7, pl. ii, fig. 2.

During a storm in August, 1920, when a quantity of flotsam was cast on to our ocean beaches, the little catshark here noticed was obtained alive. The buffetting it encountered probably induced it to leave its protecting egg-case somewhat prematurely, but, apart from enemies, it would probably have survived, as the yolk sac was well-nigh absorbed.

Its characters are well developed, so there is small difficulty in identifying it, at least generically. The large fifth gill-opening and the close proximity thereto of the fourth, is characteristic of the genus *Parascyllium*: in this young specimen the fourth slit is not at all apparent; it lies on the anterior edge of the fifth, and it can therefore be scarcely represented in a profile drawing. Presuming that it

Fig. 334. *Parascyllium ferrugineum*.

* Previous numbers appeared in the "Records of the Australian Museum."

is one of the two species recorded from our waters, it may be assigned to *P. ferrugineum* McCull., hitherto known only from three examples, the type taken outside Port Philip Heads in November, 1909, another specimen obtained in the Australian Bight in 22 fathoms in September, 1914, and a third taken at Encounter Bay, 1919, and forwarded by Mr. H. Dutton. An illustration of the young specimen taken on the Glenelg beach is supplied for comparison with that published by Mr. McCulloch. Remembering the changes that take place with growth, no useful purpose would be served by making the usual comparative measurements, but it may be noted that the young shark is corporally well equipped for its advent of independent existence. As is usual, the umbilical vessels enter the body at the fore-end of the thorax, and in the specimen here considered, and as above mentioned, the contents of the yolk sac have been nearly absorbed. The spiracle lies close below the hinder corner of the eye.

The colour markings of the adult are indistinct; in the young they are very pronounced, and serve to show whence the adult pattern is derived. The nasal, ocular, and branchial bands are simple, but those that follow have each the form of a double diamond-shaped figure laid across the back; between each figure, on the dorsal line, is a large round black spot, and a fainter one below it. These spots, together with one on the lower point of each diamond and one on each fin, are evidently responsible for the smaller black spots of the adult into which they break up.

The accompanying illustration represents the young of natural size; the tail portion has been duplicated for more accurate comparison.

Length of specimen, 168 mm.

RECORD OF A EUROPEAN MOLLUSC
NOT PREVIOUSLY REPORTED FROM AUSTRALIA.

By SIR JOSEPH VERCO, M.D., F.R.C.S., HON. CURATOR IN MOLLUSCA.

MORE than fifty living examples of a bulimoid mollusc were sent to the South Australian Museum by the Department of Agriculture, having been received from Mr. Kieselbach of Mount Gambier.

They are quite unlike any pulmonate recorded from South Australia, but correspond with a European form. Mr. Charles Hedley, of the Australian Museum, Sydney, compared them with specimens of *Helicella ventricosa* from Egypt, and found they closely agreed. They are evidently an introduced form, not hitherto recorded for Australia.

The following is the bibliography of the species:

Bulimus ventricosus Draparnaud, Tab. des Moll., 1801, pl. iv, fig. 31, 32; Deshayes, Anim. s. Vert. (ed. 2), viii, 1838, p. 235, No. 31.

Helicella (*Cochlicella* Risso, 1826) *ventricosa* Tryon, Man. Conch. (ser. 2), Pulmonata, iv, 1888, p. 32, pl. vi, fig. 83-85, dimensions 9 mm. x 5·5 mm.; Pilsbry, *op. cit.*, ix, 1894, p. 26=*H. ventrosa* auct, and *H. bulimoides* Moq.

Locality. (Tryon.) "Mediterranean Region, Canaries, Azores, and Bermuda (introduced)."

Our specimens reach 10 mm. x 5·0 or 5·5 mm, and so are slightly longer and relatively narrower than the European examples.

UNDESCRIBED CRANE-FLIES (Tanyderidae and Tipulidae) in the South Australian Museum.

By DR. CHARLES P. ALEXANDER, Urbana, Illinois.

Fig. 335, 336.

The extensive collections of Australian crane-flies contained in the South Australian Museum have been kindly sent to me for determination by the Board of Governors. A considerable number of new species, distributed in many genera, were found to be included; of these genera, *Orimargula, Elephantomyia, Ceratocheilus, Epiphragma, Stibadocerella*, and *Phacelodocera* had never been recorded from the Australasian region. Most of the novelties were from localities in which little or no work had been done on the Tipulidae, such being Tasmania, the Dorrigo Tableland in New South Wales, Lord Howe and Norfolk Islands, and Bathurst and Melville Islands in North Australia. The writer's thanks are due to the various collectors of this unusually valuable series of Australian Tipuloidea, especially to the Museum Entomologist, Mr. Arthur M. Lea, who personally collected most of the material. The types of all the new species have been returned to the South Australian Museum, paratypes of some species represented by more than two individuals being preserved in the writer's collection.

Venation. The wing-venation of the species of crane-flies considered in the present report is interpreted in accordance with the principles of the Comstock-Needham system (fig. 335). The fundamentals of this system are briefly outlined here, the students being referred to more detailed accounts (1) for additional particulars.

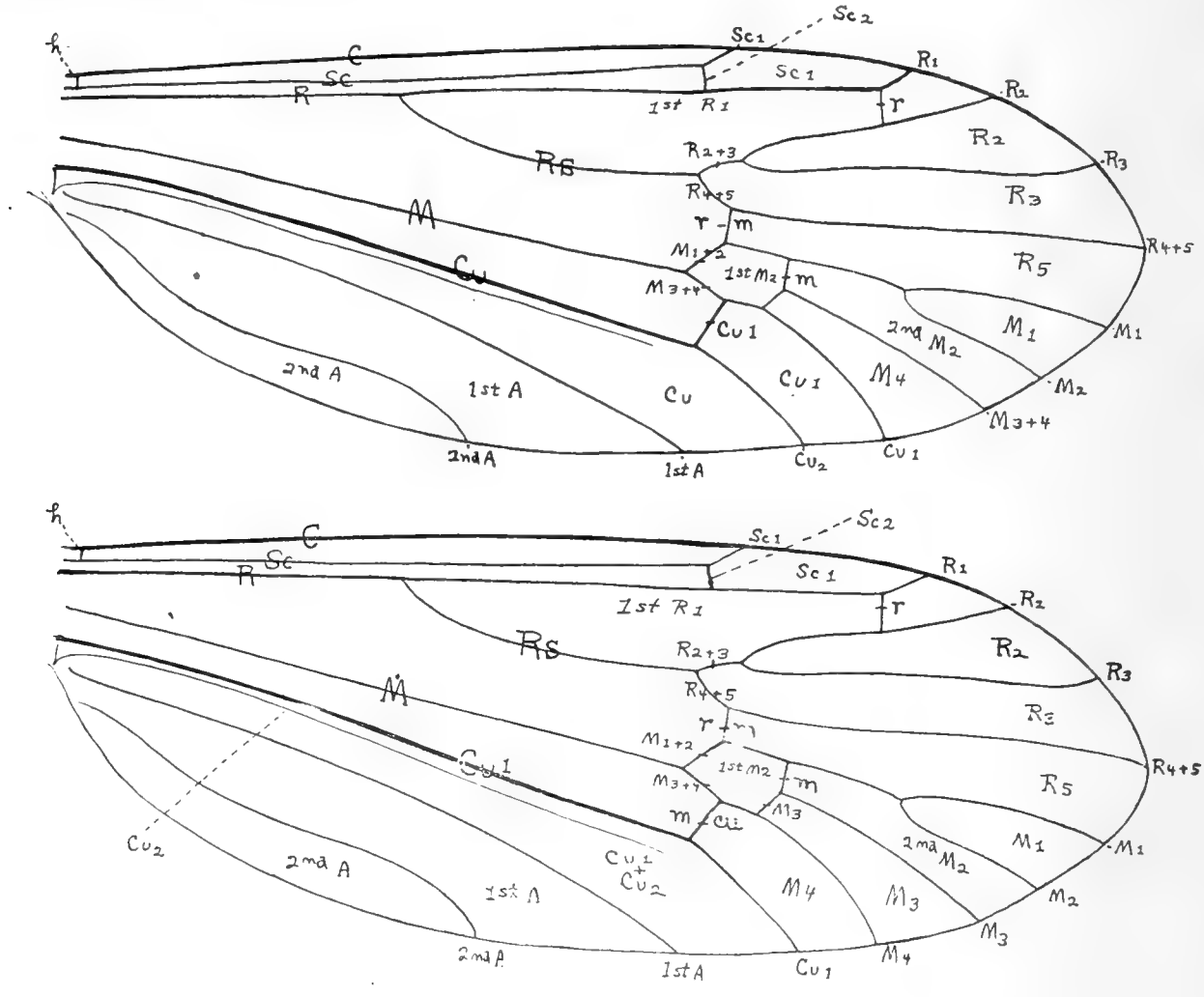
The wing of an insect is composed of membranes traversed by a series of longitudinal veins extending from the base to the outer margin, and bound together at various points by cross-veins and deflections of the longitudinal veins, which form strong fusions at these places. There are six or seven longitudinal

(1) Comstock, John Henry. The Wings of Insects, 1918, p. 1-430.
Needham, James George. Report of the entomologic field station conducted at Old Forge, New York, in the summer of 1905. New York State Entomologist. Report 23, 1908, p. 156-248.
Alexander, Charles Paul. The Crane-flies of New York. Cornell University Agricultural Experiment Station. Memoir 25. 1919, p. 860-869.

veins, named respectively from the front or anterior margin backward, Costa (C), Subcosta (Sc), Radius (R), Media (M), Cubitus (Cu), and the Anal veins. The longitudinal veins are always indicated by capital letters, followed by subnumerals to indicate the number of the branch.

Costa (C) forms the anterior margin of the wing and is unbranched.

Subcosta (Sc) is a weak vein lying between costa and radius, forked once, usually near its tip, the anterior branch (Sc^1) connecting with costa, the posterior branch (Sc^2) connecting with radius. Sc^2 tends to migrate toward the wing-base and simulates a crossvein.



Wing-Venation of *Gynoplistia*, sp.

Fig. 335 (upper). Interpreted according to the Comstock-Needham system.
Fig. 336 (lower). Interpreted as modified by Tillyard.

A=anal veins.
C=costa.
Cu=cubitus
M=media.
R=radius.
Sc=subcosta.
h=humeral crossvein.
m=medial crossvein.
m-cu=medial-cubital crossvein.
r=radial crossvein.
r-m=radial-medial crossvein.
Rs=radial sector.

Radius (R) is typically five-branched. The principal branch (R^1) runs parallel to the anterior margin, at about mid-length giving off a strong branch, the radial sector (Rs) or praefurca, which, in turn, is dichotomously twice forked. In most Tipulidae, the two posterior branches, R^4 and R^5, are fused into a single branch, R^{4+5}.

Media (M) occupies the median area of the wing. Its behaviour is like that of the radial sector, being dichotomously twice forked. The upper fork carries the branches M^1 and M^2, the lower fork carries the branches M^3 and M^4. In the system used, M^3 and M^4 are interpreted as being fused, M^{3+4}, or, for convenience, M^3 alone in the Limnobiinae.

Cubitus (Cu) is a powerful vein lying between media and the first anal vein; it is forked once, the anterior branch (Cu^1) being united with the posterior branch of media either by direct fusion or by the short medial-cubital (m-cu) crossvein.

Behind cubitus are one or two simple veins, the anal veins (A).

There are five primary cross-veins, which are indicated by small letters: the humeral (h), in the base of cell C; radial (r), in cell R^1, connecting R^1 with either R^{2+3} or R^2 alone; radial-median (r-m), connecting the posterior branch of radius with the anterior branch of media; medial (m), connecting the upper fork of media with the posterior fork, and, if present, closing the discal cell (first M^2); medial-cubital (m-cu) is present only in the generalized forms, being obliterated by the fusion of the anterior branch of Cu on the anterior branch or trunk of M.

The cells of the wing take their name from the veins immediately before or in front of them, as indicated by the accompanying figures. In the case of fused veins, the cell takes its name from the last element of the fusion.

Recently Dr. Tillyard (2) proposed an important modification of the Comstock-Needham system. This modification involves the medial and cubital fields, the principal features being shown on fig. 336. According to this interpretation, which, in the writer's opinion, is very probably the correct one, media is considered as having four persistent branches, M^3 and M^4 being separate; the latter branch corresponding to the branch Cu^1 of the Comstock-Needham system. Cubitus is interpreted by Tillyard as having but a single primary branch, C^1 corresponding to Cu^2 of the Comstock-Needham system. In the Panorpoid Complex, Tillyard holds that cubitus forks close to the wing-base, the posterior branch, Cu^2 being semiatrophied and lying close behind the primary branch of cubitus.

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(2) Tillyard, R. J. The Panorpoid Complex. Part 3: The Wing-Venation. Proc. Linn. Soc. N.S. Wales, xliv, 1919, p. 533-718.

FAMILY TANYDERIDAE.

TANYDERUS Philippi, 1865.

The genus *Tanyderus* includes eight described species, of which four are from the Australasian Region, although none had previously been discovered in Australia or Tasmania. The distinctions between *Tanyderus* and *Protoplasa* become less clearly defined with the constant accession of new forms, and it may become necessary to unite the two genera. In this latter case, the family name would become Macrochilidae or Protoplasidae.

TANYDERUS AUSTRALIENSIS sp. nov.

Mouth-parts much longer than the head; antennae with fifteen segments; general colouration dark brown; wings hyaline with three dark brown cross-bands; veins conspicuously hairy; a supernumerary cross-vein in cell R^4.

♀ Length, about 9 mm.; wing, 11 mm.; rostrum alone, 1·4 mm.

Mouth-parts conspicuous, produced into elongate stylets that are about twice as long as the head; palpi dark brown, elongate, subtending the blade-like parts. Antennae with only fifteen segments; scapal segments dark brown; flagellar segments cylindrical, gradually decreasing in length from the basal to the terminal; verticils inconspicuous, those on the terminal segments slightly longer. Front slightly produced, dark brown, sparsely pruinose; vertex black, grey pruinose. Pronotum short, as in *T. beckeri* Riedel. Mesothorax discoloured, brown, the median area of the praescutum darker brown. Pleura brown, indistinctly variegated with darker. Halteres yellow, the knobs abruptly dark brown. Legs with the coxae and trochanters dark brown; femora yellow, the tips broadly dark brown; tibiae brownish-yellow, the extreme bases and tips dark brown; tarsi light reddish-brown; legs short and comparatively hairy. Wings hyaline with three broad dark brown cross-bands; one basal; the second occupying the general level of the cord; the third band occupies the wing-apex; the basal area extends to the origin of Rs and to about one-third the length of cell second A, there being a quadrate hyaline area in cell R near the base; the second area is broadest at the anterior margin, extending very obliquely basad to include the apical third of cell second A; there are small hyaline areas along the costal margin of this band in cells C and Sc, before and just beyond the union of Sc^2 with R; the third or apical band includes the outer ends of cells Sc^1 and R^1; all but a small basal portion of R^2; the outer third of R^3; the outer two-fifths of R^4, this latter, however, interrupted by a conspicuous rectangular hyaline area before the end of the cell; more than the distal half of cell R^5 is darkened; the outer ends of cells first M^2, M^3 and Cu^1 are darkened, and all of cells M^1 and second M^2

excepting a small hyaline area which occupies the base of M^1 and covers the middle of cell second M^2; anal angle yellowish; veins dark brown, more yellowish in the hyaline areas. Venation: Sc^1 lacking; Sc^2 ending in R before the level of the outer end of cell first M^2; the tip of Sc^2, after fusing with R for a distance about its own length, breaks away and appears as a conspicuous oblique vein provided with macrotrichiae; origin of Rs far back near the wing-base, R before this origin being only about one-half of Rs; cell first M^2 very long and narrow, lying far out in the membrane, vein M^3 beyond it being less than one-half the length of cell first M^2; basal deflection of M^2 much longer than m; anal vein short and straight, cell A being relatively narrow; a single supernumerary cross-vein situated in cell R^4 some distance beyond the level of the fork of R^{2+3}; veins provided with long, conspicuous macrotrichiae. Abdomen discoloured; apical half of the tergites darker and more glabrous than the basal half. Valves of the ovipositor orange.

Hab. Tasmania: Southport. Type, I. 12134.

FAMILY TIPULIDAE.

DICRANOMYIA Stephens, 1829.

DICRANOMYIA PUNCTIPENNIS OCCIDENTALIS sub. sp. nov.

♂ Length, about 5·8 mm.; wing, 8 mm. ♀ Length, 8 mm.; wing, 9·3 mm.

Closely resembling typical *D. punctipennis* Skuse (South-eastern Australia), differing as follows:

Median praescutal stripe very narrowly and indistinctly split by a capillary pale line. Legs with the femora dark brown, only the bases narrowly brightened. Wings with the dark clouds on the radial and cubital forks scarcely apparent, the veins being dark brown throughout. Venation: Sc^1 shorter than r-m. Abdomen dark brown, the sternites a little paler.

Hab. Western Australia: Warren River (W. D. Dodd). Type, I. 12135.

DICRANOMYIA INHONORA sp. nov.

General colouration grey, the praescutum with three brown stripes; fore femora yellow, the tips broadly blackened; middle and hind femora with an indistinct subterminal brown ring; wings whitish-subhyaline, with three conspicuous brown blotches along vein R before the stigma, these areas about as extensive as the interspaces.

♂ Length, 7 mm.; wing, 8·8 mm. ♀ Length, 6·5–8 mm.; wing, 8–9 mm.

Rostrum and palpi dark brown. Antennae dark brown; flagellar segments submoniliform. Head light grey. Mesonotal praescutum light grey with three dark brown stripes, the median stripe broad and conspicuous; scutal lobes brown;

remainder of the mesonotum grey. Pleura heavily grey-pruinose, brighter ventrally. Halteres short, pale. Legs with the coxae dark, sparsely pruinose; trochanters reddish-yellow; femora yellow, the tips of the fore femora broadly dark brown, on the other femora with a narrow subterminal ring instead of the dark apex; tibiae brownish-yellow, the tips narrowly darkened; tarsi brown, the terminal segments darger. Wings whitish subhyaline; stigma oval, greyish-brown; three conspicuous brown clouds along R before the stigma, the first at h, the third at the origin of Rs and the tip of Sc, these dark marks subequal in extent to the pale interspaces; paler grey clouds along the cord and outer end of cell first M^2; tips of the anal veins and near midlength of vein first A clouded; veins dark brown in the infuscated areas, more yellowish elsewhere. Venation: Sc short, Sc^1 ending a short distance beyond the origin of Rs, Sc^2 at the tip of Sc^1; Rs about twice the deflection of R^{4+5}; cell first M^2 subquadrate; basal deflection of Cu^1 before the fork of M; anal angle rather prominent. Abdomen dark brown, pruinose; sternites more yellowish, the subterminal sternites infuscated.

Hab. South Australia: Port Lincoln; Tasmania: King Island; Lord Howe Island (A. M. Lea). Type, I. 12136.

D. inhonora is apparently most closely related to *D. obscura* Skuse.

DICRANOMYIA BREVIRAMA sp. nov.

Head and rostrum brownish-yellow; antennal scape brownish-yellow, the flagellum dark brown; wings yellowish; Sc short, cell first M^2 closed; abdominal tergites dark brown, the caudal margins narrowly pale.

♀ Length, 6 mm.; wing, 7·2 mm.

Rostrum and palpi light brownish-yellow. Antennal scape brownish-yellow; flagellum dark brown, the segments oval. Head brownish-yellow. Mesonotal praescutum yellow with a reddish sublateral stripe on either side; scutal lobes a little darker than the remainder of the scutum; scutellum yellowish, a little darker medially at the base; postnotum reddish medially, more yellowish laterally. Pleura reddish-yellow, very sparsely pruinose, the propleura clearer yellow. Halteres yellow, the knobs brown. Legs with the coxae obscure yellow; trochanters yellow, remainder of the legs pale brownish-testaceous. Wings with a light yellowish suffusion, a little darker along the costal margin; stigma indistinct; veins brownish-yellow. Venation: Sc short, Sc^1 ending immediately before the origin of Rs, Sc^2 some distance from the tip of Sc^1, the latter alone being nearly as long as the basal deflection of Cu^1; Rs short, strongly arcuated, a little longer than the slightly less arcuated basal deflection of R^{4+5}; cell first M^2 rectangular, m about one-half the outer deflection of M^3; basal deflection of Cu^1 at the fork of M. Abdominal tergites dark brown, the caudal margins of the segments

narrowly yellowish; dorsal shield of the ovipositor dark brown; sternites obscure yellow. Ovipositor with the valves very small, the tergal valves upcurved, acute at the tips.

Hab. Lord Howe Island (A. M. Lea). Type, I. 12137.

D. brevirama is nearly related to *D. auripennis* Skuse, differing in the colouration of the head, antennae, and abdomen.

DICRANOMYIA SUBREMOTA sp. nov.

Antennae dark brown; general colouration grey; mesonotal praescutum and scutum marked with light brown; legs brownish-yellow, the tips of the tibiae narrowly dark brown; wings faintly greyish-yellow, sparsely spotted with brown; Sc short, basal deflection of Cu^1 far before the fork of M.

♂ Length, about 5 mm.; wing, 6 mm. ♀ Length, 5·4 mm.; wing, 6·5–6·7 mm.

Rostrum and palpi dark brown. Antennae dark brown; flagellar segments suboval. Head grey. Mesonotum grey, with three broad but ill-defined light brown stripes; scutal lobes light brown, median area grey; remainder of mesonotum grey. Pleura dark, grey pruinose. Halteres light brown, yellow basally. Legs with the coxae dark brown; trochanters obscure brownish-yellow; femora brownish-yellow, the tips indistinctly darkened; tibiae and metatarsi obscure yellow, the tips narrowly but conspicuously dark brownish-black; terminal tarsal segments blackened. Wings with a faint greyish-yellow tinge, with very small and indistinct brown seams, arranged as follows: at arculus; at origin of Rs; the stigmal area, appearing as a narrow seam to r; narrow seams along the cord and outer end of cell first M^2; veins pale yellowish-brown. Venation: Sc short, Sc^1 extending a short distance beyond the origin of Rs, Sc^2 some distance from the tip of Sc^1, lying before the origin of Rs; Sc^1 alone about equal to the basal deflection of Cu^1; Rs long, gently arcuated, about twice the deflection of R^{4+5}, the latter about equal to the first section of vein R^{2+3}; r at about one-third R^{2+3}; r-m faint; basal deflection of Cu^1 about its own length before the fork of M; Cu^2 longer than the basal deflection of Cu^1. Abdominal segments dark brown; genital segments obscure yellow.

Hab. Norfolk Island (A. M. Lea). Type, I. 12138.

DICRANOMYIA IDONEA sp. nov.

General colouration dull yellow; antennae moniliform; halteres with the apices tipped with yellow; legs short, hairy, yellow, the femora with two narrow brown subterminal rings; tibiae and first three tarsal segments tipped with black; wings pale yellow, sparsely spotted and clouded with brown and grey; Rs and

the basal deflection of R^{4+5} strongly arcuated at origin; inner end of cell first M^2 strongly arcuated; abdominal tergites dull yellow, the basal half of each segment dark brown; base of the sternal valves of the ovipositor shiny black.

♀ Length, about 5·8–6·5 mm.; wing, 7–7·4 mm.

Rostrum and palpi dark brown, the former slightly elongate. Antennae dark brown; flagellar segments moniliform, each segment except the terminal ones being broader than long, subdisciform, closely appressed to one another. Head dark. Mesonotum dark brown (discoloured, in fresh specimens probably covered with a light pollen). Pleura dark brown, pruinose. Halteres pale, the base of the knobs brown, the apices yellowish. Legs with the coxae brownish-yellow; trochanters brownish-yellow; legs short, femora slightly incrassated at tips, hairy, reddish-orange in colour, the apical half more yellowish with two narrow subterminal brown rings; tibiae and basal three tarsal segments brownish-yellow, the tips conspicuously blackened; segments four and five entirely black. Wings with a yellowish tinge; restricted brown markings as follows: at arculus, origin of Rs, tip of Sc, along the cord and outer end of cell first M^2 and at the tips of the longitudinal veins; paler grey clouds at the stigma; a large blotch about midway between arculus and the origin of Rs; clouds near the outer ends of cells second R^1, R^3, R^5, second M^2 and M^3; outer ends of the posterior and anal cells indistinctly greyish; veins dark brown, C, Sc, and R more brownish-yellow. Venation: Sc extending to about opposite midlength of Rs, Sc^2 some distance from the tip of Sc^1, the latter alone being longer than r; Rs and the basal deflection of R^{4+5} strongly arcuated at origin, the latter about two-thirds the former; inner end of cell first M^2 considerably arcuated, r-m being placed beyond midlength of cell first M^2; this latter cell about as long as vein M^{1+2} beyond it; basal deflection of Cu^1 before the fork of M, about opposite the fork of Rs; cell second A broad. Abdominal tergites dull yellow, the basal half of each tergite dark brown; sternites yellowish; pleural membrane dull brown. Ovipositor with the sternal valves long, straight, powerful, the apices acute, the bases shiny black; tergal valves small, acute.

Hab. Tasmania: King Island (A. M. Lea). Type, I. 12139.

DICRANOMYIA SEDATA sp. nov.

Head grey; mesonotum brown; pleura obscure yellow with a narrow brown longitudinal stripe; wings light grey with narrow seams and clouds along the cord, outer end of cell first M^2 and origin of Rs; vein Sc long, cell first M^2 closed.

♂ Length, about 5·5 mm.; wing, 5·4 mm.

Rostrum light brown; palpi brown. Antennae dark brown (flagellum broken). Head grey. Mesonotum brown (injured by the pin). Pleura obscure

yellow with a conspicuous but narrow dark brown longitudinal stripe. Halteres light brown. Legs long and slender; coxae and trochanters brownish-yellow; femora brownish-testaceous, the tips narrowly darkened; remainder of the legs light brown. Wings light grey, cell Sc a little more brownish; stigma short-oval, dark brown; paler brown clouds at the origin of Rs; tip of Sc^1; along the cord and outer end of cell first M^2; veins brown. Venation: Sc long, Sc^1 ending about opposite three-fifths Rs, Sc^2 at the tip of Sc^1; Rs long, strongly arcuated at origin; r at the tip of R^1; cell first M^2 closed, pentagonal; m about one-half the outer deflection of M^3; basal deflection of Cu^1 immediately before the fork of M; Cu^2 and the basal deflection of Cu^1 subequal. Abdomen dark brown, the bases of the tergites indistinctly pale; sternites with the apical half of each segment brown, the basal half yellowish. Male hypopygium comparatively large, complicated; pleurites large, subglobular, the inner face before the apex produced into a complex fleshy lobe; appendages very small and inconspicuous. Gonapophyses complicated, arranged in two pairs, the outer pair shorter, finely transversely wrinkled, terminating in a small conical tooth; inner apophyse longer, appearing as pale flattened blades, each with a small tooth on the outer margin beyond midlength.

Hab. Queensland: Cairns district (A. M. Lea). Type, I. 12140.

DICRANOMYIA NORFOLCENSIS sp. nov.

♀ Length, 5·8 mm.; wing, 6·3 mm.

Related to *D. sedata,* sp. nov., differing as follows:

Femora with the tips narrowly pale, there being a subterminal brown ring of approximately equal extent. Wings more yellowish than grey; Sc much longer, extending to about opposite three-fourths the length of the longer Rs; basal deflection of R^{4+5} longer, more than twice as long as r-m; cell first M^2 more regularly rectangular. Abdominal tergites dark brown, narrowly and indistinctly paler basally; sternites obscure brownish-yellow.

Hab. Norfolk Island (A. M. Lea). Type, I. 12141.

LIBNOTES Westwood, 1876.

LIBNOTES TERRAE-REGINAE sp. nov.

Head yellow, the vertex and occiput marked with dark brown; femora yellow with a broad dark brown subterminal ring; wings subhyaline, cells C and Sc yellowish; veins conspicuously seamed with brown; Rs long, strongly arcuated; vein second A short and strongly arcuated.

♂ Length, 7 mm.; wing, 9 mm.

Rostrum light brown; palpi dark brown. Antennae dark brown. Head yellow, the middle of the vertex and the occiput brown; vertex between the eyes very narrow. Pronotum grey, more infuscated medially. (Praescutum destroyed by the pin.) Scutellum and postnotum dark brown, sparsely greyish pruinose. Pleura reddish-yellow, with a large brown blotch on the mesepimeron and another on the lateral sclerites of the postnotum, the surface sparsely pruinose. Halteres obscure yellow, the knobs dark brown. Legs with the coxae infuscated; trochanters brownish-yellow; femora yellow with a broad dark brown subterminal ring, preceded and followed by a narrow, brighter yellow annulus; tibiae brownish-yellow, the tips narrowly infuscated, the base a little darkened; basal two tarsal segments brownish-yellow, the tips darkened; remainder of the tarsi dark brown. Wings subhyaline, cells C and Sc light yellow; stigma large but not solidly filled in, brown; conspicuous brown seams as follows: At Sc^2; at the origin of Rs; along the cord and outer end of cell first M^2 and as conspicuous seams along veins R^{2+3}, M^{1+2}, M^3, Cu^1, Cu^2, and the anal veins; anal angle of the wing narrowly darkened. Venation: Sc^1 ending a short distance beyond the fork of Rs; Rs long, strongly arcuated for a member of this genus; r a short distance from the tip of R^1, which is bent strongly into the costa; inner ends of cells R^3, R^5 and first M^2 about in alignment; r-m about equal to the deflection of R^{4+5}; m about equal to the outer deflection of M^3, but much more arcuated; vein second A short and strongly arcuated. Abdominal tergites dark brown, the hypopygium a little more reddish; sternites reddish-yellow with a faint greenish tinge, the segments broadly and conspicuously bordered laterally with black.

Hab. Queensland: Mount Tambourine (A. M. Lea). Type, I. 12142.

LIBNOTES OBLIQUA sp. nov.

General colouration of the thorax obscure brownish-yellow; wings subhyaline, the stigma small and indistinct; Rs short and straight, in alignment with the deflection of R^{4+5}; a supernumerary cross-vein in cell Sc^1 before r.

♀ Length, about 5·5 mm.; wing, 7·3 mm.

Rostrum and palpi dark brown. Antennae with the scapal segments light brown (flagellum broken). Head light grey. Pronotum obscure yellow, more brownish medially. Mesonotum obscure brownish-yellow, without distinct darker markings. Pleura obscure yellow. Halteres brownish-yellow (the knobs broken). Legs with the coxae obscure brownish-yellow, the outer faces slightly infuscated; trochanters obscure yellow; femora brownish-yellow (broken shortly beyond their bases). Wings subhyaline, the stigmal spot very small and indistinct; veins brown. Venation: Sc moderately long, ending opposite r-m, Sc^2 at the tip of Sc^1; Rs very short and straight, about twice the deflection of R^{4+5};

these two veins being in oblique alignment; R^1 projecting beyond r, the tip atrophied; a supernumerary cross-vein in cell Sc^1 about its own length before r; veins beyond the cord long and parallel; m a little longer than the outer deflection of M^3, slightly arcuated; basal deflection of Cu^1 beyond midlength of cell first M^2. Abdomen dark brown. Ovipositor with the valves small and slender, reddish horn-colour.

Hab. Queensland: Cairns district (A. M. Lea). Type I. 12143.

L. obliqua is closely allied to *L. nervosa* de Meijere, from which it differs in the different pattern of the wings and the venation, especially the longer Sc, Rs, and cell first M^2.

LIBNOTES HOWENSIS sp. nov.

General colouration yellow, the mesonotum grey-pruinose; pleura striped longitudinally with dark brown lines; femora with a narrow dark brown subterminal ring; wings light yellow, very sparsely and indistinctly marked with brown.

♂ Length, about 15 mm.; wing, 17·2 mm. Middle leg, femur, 14·7 mm.; tibia, 13·5 mm.; tarsus, 11·5 mm.

Rostrum moderately elongate, yellow; palpi short, dark brown. Antennae with the elongate basal segment dusted with grey; second segment dark brown; flagellar segments yellow, the distal segments gradually infuscated; basal flagellar segments oval, the terminal segments more elongated. Head light cream colour. Vertex between eyes very narrow. Mesonotal praescutum light grey, very indistinctly marked with darker grey; scutum whitish grey, the centres of the lobes darker grey; remainder of the mesonotum whitish-pollinose. Pleura whitish-pollinose, narrowly lined with longitudinal dark brown stripes; the more dorsal of these lies behind the wing-root on the lateral selerite of the postnotum; a second stripe begins above the fore coxa, traversing the mesepisternum and mesepimeron, becoming obsolete near the halteres. Halteres yellow, the knobs brown. Legs with the coxae yellow; a dark brown spot on the outer face of the fore coxa; femora yellow, the tips almost whitish; a narrow (about 0·9 mm.) subterminal brown ring; tibiae yellow, the tips narrowly darkened; basal two tarsal segments yellow, the tips narrowly darkened; terminal three tarsal segments black. Wings light yellow; stigma indistinct; very faint brown spots at the origin of Rs; fork of M; at the basal deflection of Cu^1; at m and the tips of veins Cu^2, first A and second A, larger and more conspicuous on the latter; veins yellow, darker in the infuscated areas. Venation: Rs almost straight, in alignment with R^{4+5}; r at the tip of R^1; cell first M^2 long and narrow; m nearly as long as Rs; basal deflection of Cu^1 at about one-fifth the length of the long cell

first M^2. Abdominal tergites dull yellow, the apical third of each tergite delicately and beautifully surface-reticulated.

Hab. Lord Howe Island (A. M. Lea). Type, I. 12144.

ORIMARGULA Mik, 1883.

ORIMARGULA AUSTRALIENSIS sp. nov.

General colouration light grey, the mesonotal praescutum with three confluent brownish stripes; halteres and legs brownish-yellow; wings whitish subhyaline, the stigma and cord narrowly and indistinctly infuscated.

♂ Length, about 3·8–4 mm.; wing, 5 mm. ♀ Length, 5·3 mm.; wing, 5·5 mm.

Rostrum reddish-brown, sparsely pruinose; palpi dark brown. Antennae of moderate length in both sexes, dark brown; flagellar segments oval. Head dark grey pruinose. Mesonotum light grey, the praescutum with the stripes rather indistinct, brown, entirely confluent; scutal lobes brown, the median area pruinose; scutellum pale, sparsely pruinose; postnotum brown, sparsely pruinose. Pleura light grey. Halteres brownish-yellow. Legs with the coxae yellow, very sparsely pruinose; trochanters brownish-yellow; femora and tibiae brownish-yellow, becoming darker towards the tips; tarsi light brown, the distal tarsal segments dark brown. Wings whitish-subhyaline; stigma brown; cord narrowly and indistinctly seamed with pale brown; in some specimens the wings are much more nearly unicolourous; cell Sc yellow; veins pale brown, veins Sc and R yellow. Venation: Rs long, straight, or weakly convex; r on R^{2+3} a little less than its own length beyond the fork of Rs; Rs and the deflection of R^{4+5} subequal in length; r-m a little shorter than the deflection of M^{1+2}; petiole of cell M^3 short, about equal to r; fusion of Cu^1 and M about equal to M^3 alone; basal deflection of Cu^1 a short distance beyond the fork of Rs and nearly in alignment with r; second anal vein short and straight. Anal angle of the wing prominent, as in the genus. Abdomen dark brown, sparsely pruinose.

Hab. Queensland: Cairns district (A. M. Lea). Type, I. 12145.

The genus is new to the Australasian region.

ELEPHANTOMYIA Osten Sacken, 1859.

ELEPHANTOMYIA FUMICOSTA sp. nov..

General colouration brownish-yellow; legs black, the tarsi largely white; wings greyish-brown, the costa and a conspicuous seam along the cord dark brown; abdominal segments two to seven yellow, ringed caudally with dark brown.

♂ Length (excluding rostrum), 9·5–10 mm.; wing, 7·8 mm.; rostrum, about 5·5 mm.

Rostrum dark brown. Antennae dark brown, the basal flagellar segment elongate-conical, the terminal segments elongate-cylindrical. Head brown, light yellow beneath. Mesonotal praescutum yellow or brownish-yellow without darker markings; remainder of the mesonotum slightly darker. Pleura yellow, the sternum a little darker. Halteres brown. Legs with the coxae and trochanters pale brown; femora and tibiae dark brownish-black; metatarsi black, the tips narrowly and abruptly white; segments two and three white, the terminal two segments infuscated; claws reddish. Wings with a greyish-brown tinge, the costal margin dark brown, this colouration continued around the wing-margin to the end of vein R^{4+5}; cord and the origin of Rs broadly seamed with dark brown; cell R^1 dark brown, with the exception of a large area of the pale ground-colour at the base; veins dark brown. Venation: Rs rather straight, angulated at origin; R^{2+3} almost perpendicular at origin, slightly spurred at the bend; basal deflection of R^{4+5} about equal to r-m; cell first M^2 rather large; basal deflection of Cu^1 about equal to m. Abdominal segment one obscure yellow; segments two to seven yellow, the caudal margin narrowly dark brown, these markings narrowest on the basal segments, broadest on the seventh segment, where it includes about the distal half; remainder of the abdomen dark brown.

Hab. North Queensland: Kuranda (F. P. Dodd), Babinda, August 7 1920 (J. F. Illingworth). Type, I. 12146, in South Australian Museum; paratype, alcoholic, in the collection of the author.

The genus *Elephantomyia* has not hitherto been recorded from Australia.

CERATOCHEILUS Wesché, 1910.

Ten species of this well-defined genus have now been made known. It is of great interest to add still another form, the first from the Australian Region. It is possible that *Rhamphidia levis* Hutton, of New Zealand, is a member of this genus.

CERATOCHEILUS AUSTRALASIAE sp. nov.

Thorax brownish-yellow, the praescutum with three broad, nearly confluent, brown stripes; pleura brownish-yellow with a broad, dark brown longitudinal stripe; wings strongly infuscated, unspotted; cell first M^2 closed.

♀ Length (excluding rostrum), 8 mm.; wing, 7·8 mm.; rostrum 5·5 mm.

Rostrum slender, dark brownish-black. Antennae dark brownish-black. Head yellowish-grey, the median area of the vertex a little infuscated; corniculus small, subcircular, yellowish-brown. Pronotum dark brown. Lateral margins of the mesonotal praescutum brownish-yellow, the disk with three broad dark brown stripes, the anterior ends of the lateral stripes confluent with the median stripe, restricting the ground-colour to two indistinct streaks near the suture;

scutal lobes dark brown; scutellum and postnotum reddish-testaceous, brown medially, sparsely pruinose. Pleura obscure brownish-yellow, with a broad dark brown longitudinal stripe extending from the pronotum to the base of the abdomen, passing through the base of the halteres. Mesosternum between the fore and middle coxae pale brown. Halteres pale brown, the knobs darker. Legs with the coxae and trochanters brown, the femora brown, paler basally; tibiae and tarsi darker brown; hairs on the legs profoundly bifid as in the genus. Wings with a strong brownish tinge, a little darker along the cord; cells C and Sc darker brown; veins dark brown. Venation: Sc^1 ending a short distance beyond the origin of Rs, Sc^2 opposite this origin; Rs short, straight, subequal to the deflection of R^{1+5}; R^{2+3} sinuous, about twice the length of the sector; cell first M^2 closed, m a little more than one-half the outer deflection of M^3; basal deflection of Cu^1 a short distance beyond the fork of M. Abdomen dark brown; valves of the ovipositor reddish horn-colour.

Hab. Lord Howe Island (A. M. Lea). Type, I. 12147.

MOLOPHILUS Curtis, 1833.

MOLOPHILUS GIGAS sp. nov.

Antennae short in both sexes; size very large (wing of female 9 mm.); general colouration dark brown; femora yellow, the apical half brownish-black; wings amber-yellow.

♂ Length, about 6·5 mm.; wing, 8·7 mm. ♀ Length, about 8 mm.; wing, 9 mm.

Rostrum and palpi dark brown, the former dusted with grey. Antennae short in both sexes; scape dark brown; flagellar segments brown, the base of each segment obscure yellow to produce an indistinct bicolorous appearance; terminal flagellar segments uniformly dark brown. Head dark, conspicuously light grey-pruinose; vertex with conspicuous proclinate bristles. Pronotum brown. Mesonotal praescutum brown, grey-pruinose, with four darker brown stripes, the intermediate pair confluent anteriorly; region cephalad of the pseudosutural foveae rufous; tuberculate pits black, separated from one another by a distance about equal to the diameter of one; pseudosutural foveae conspicuous, black; remainder of the mesonotum dark brown. Pleura dark, sparsely light grey-pruinose; dorsal-pleural membranes obscure yellow; a patch of yellow hairs on the lateral sclerite of the postnotum. Halteres yellow. Legs with the coxae dark brown; trochanters yellow; femora with about the basal half yellow, the distal half conspicuously and abruptly dark brownish-black; the amount of yellow is greater on the fore and middle legs; tibiae and tarsi dark brownish-black; hind legs long, the femora incrassated. Wings with a strong amber-yellow tinge; veins

yellow, clothed with conspicuous brown hairs. Venation: Fusion of M^3 and Cu^1 about equal to the basal deflection of Cu^1 alone. Abdomen dark brown, the caudal margin of the tergites narrowly and indistinctly paler; abdomen clothed with long, conspicuous yellow hairs. In the female the sternites are more yellowish. Ovipositor with the tergal valves slender, upcurved, horn-coloured; sternal valves acicular, almost straight, dark brown.

Hab. Tasmania: Waratah (A. M. Lea). Type, I. 12148.

This conspicuous species of *Molophilus* is by far the largest yet made known.

GNOPHOMYIA Osten Sacken, 1859.

GNOPHOMYIA CYANOCEPS sp. nov.

Closely related to *G. fascipennis* (Thoms.); r lacking; cell first M^2 open by the atrophy of M^3; head above with a greenish-blue bloom.

♂ Length, 6 mm.; wing, 5·2 mm. ♀ Length, 6·3 mm.; wing, 6·2 mm.

Rostrum yellow, darker in the female; palpi dark brown. Antennal scape yellow, the apex of the second segment dark brown; flagellum dark brown. Front, genae, and anterior part of the vertex yellow; remainder of the vertex dark brown with a greenish-blue bloom. Pronotum and mesonotal praescutum reddish-yellow, unmarked with darker; scutal lobes dark brown; postnotum with two small blackish spots at the posterior margin. Pleura yellow; a reddish-brown area occupying portions of the mesosternum, mesepisternum, and mesepimeron. Halteres brown at the base, the remainder of the stem and part of the knob yellowish. Legs with the coxae and trochanters yellow; femora yellow, the tips narrowly infuscated, the surface with a few scattered erect bristles; tibiae light brown, the tips dark brown; tarsi brownish-black. Wings whitish-subhyaline, cells C and Sc yellow; in the female with three conspicuous bands and the apex brown; the first band occupies the region immediately beyond the arculus, incomplete; second band broad, extending from R to the wing-margin at the tip of the second anal vein; third band broad, complete, but more diffuse posteriorly, mostly located beyond the cord; wing-apex narrowly darkened; in the male the three basal bands are only barely indicated; wing-apex uncoloured; veins dark brown; costa provided with flattened scales. Venation: Sc long, Sc^1 extending to about one-third the length of Rs; Sc^2 invisible; Rs long, almost straight; R^{2+3} about one-half longer than the basal deflection of Cu^1; r atrophied; cell first M^2 open by the atrophy of the outer deflection of M^3; basal deflection of Cu^1 a short distance beyond the fork of M. Abdominal tergites reddish-yellow in the male, the sternites lighter yellow; in the female the abdomen is dark brownish-black.

Hab. Northern Territory: Melville Island (W. D. Dodd). Type, I. 12149.

G. fascipennis (Thoms.) is related to this handsome little fly, but is readily

told by the retention of both r and the outer deflection of vein M^3. Both species are notable by their marked sexual dimorphism.

RHABDOMASTIX Skuse, 1889.

RHABDOMASTIX GENEROSA sp. nov.

Size large (wing of female over 11 mm.); antennae brownish-yellow; general colouration light grey; wings faintly yellowish; Sc long, extending to almost opposite the fork of Rs; R^{2+3} and Rs subequal in length; R^1 and R^2 closely approximated at wing-margin.

♀ Length, 9·5 mm.; wing, 11·3 mm.; antenna, about 6 mm.

Rostrum and palpi light brown. Antennae brownish-yellow, the flagellar segments a little darker; antennae if bent backward extending to about the base of the third abdominal segment. Head light grey. Mesonotum light grey, the lateral margins of the praescutum narrowly and indistinctly brownish; pleura whitish-grey. Halteres light yellow. Legs with the coxae and trochanters testaceous-yellow (remainder of the legs broken). Wings with a faint yellowish tinge; stigma barely indicated; veins yellowish-brown. Venation: Sc long, Sc^1 ending a short distance before the forking of the long Rs, Sc^1 a little shorter than the basal deflection of Cu^1; Rs long, gently arcuated at origin, about as long as R^{2+3}; R^2 a little more than one-half the length of the basal deflection of Cu^1; R^1 and R^2 close together at the wing margin, the space on costa between them being about one-third r-m; cell first M^2 small, short-rectangular, m being about one-half the outer deflection of M^3; basal deflection of Cu^1 just beyond the fork of M; Cu^2 about twice the deflection of Cu^1; vein second A moderately long. Abdominal tergites brown, indistinctly obscure yellow before their apices; sternites obscure brownish-yellow. Ovipositor with the tergal valves slender, the points slightly curved; sternal valves strongly compressed.

Hab. New South Wales: Dorrigo (W. Heron). Type, I. 12150.

TRENTEPOHLIA Bigot, 1854.

TRENTEPOHLIA DODDI sp. nov.

General colouration reddish-yellow; legs yellow; wings pale yellowish, the wing-apex very narrowly infuscated; costal and subcostal veins yellowish.

♂ Length, 5·7–5·8 mm.; wing, 6 mm. ♀ Length, 6·5–7·5 mm.; wing, 6·1 mm.

Rostrum brownish-yellow; labial palpi yellowish; maxillary palpi light brown. Antennae dark brown. Head dark grey. Mesonotal praescutum reddish-yellow, moderately shiny; scutum brown; postnotum obscure yellow, the posterior half infuscated. Pleura reddish-yellow, slightly pruinose. Halteres

yellow. Legs with the coxae and trochanters obscure yellow; remainder of the legs yellow. Wings pale yellowish, the wing-apex very narrowly infuscated, continued basad as short, narrow seams along veins R^3 and R^{4+5}; veins dark brown, C, Sc and R more yellowish. Venation: Sc^1 and R^1 far removed from one another at the wing-margin, the distance on costa between them being about equal to the basal deflection of Cu^1; Rs straight, about equal to the deflection of R^{4+5}; tip of R^1 beyond r faint and without macrotrichiae; r oblique, at about three-fifths the length of R^{2+3}; R^2 oblique, about equal to R^{4+5} plus M^{1+2}; petiole of cell R^5 less than one-half of the cell; basal deflection of Cu^1 about one-half its length before the fork of M; fusion of Cu^2 and first A at the wing-margin punctiform. Abdomen light brown, segments seven to nine brownish-black in the male; ovipositor pale.

Hab. Northern Territory: Melville Island (W. D. Dodd). Type, I. 12151.

AUSTROLIMNOBIA gen. nov.

Palpi short. Antennae with probably sixteen segments, the flagellar segments cylindrical, gradually decreasing in length from the basal to the apical, provided with conspicuous appressed hairs and a few short verticils. Pseudosutural foveae represented only by a small oval area; no apparent tuberculate pits. Legs long and stout; no tibial spurs; tarsal segments one to three each with a single small apical spur; claws relatively small, simple; empodium present. Wings with Sc long, Sc^1 not close to R^1 at wing-margin; Sc^2 some distance from the tip of Sc^1; Rs originating far basad, at one-fourth the length of the wing, the fork of Rs at midlength of the wing; Rs in alignment with R^{4+5}; R^{2+3} in alignment with R^2; r some distance from the tip of R^1; cell first M^2 very long; forks of the longitudinal veins deep; cell M^1 lacking.

The type species of this genus is one of the largest and most striking Eriopterine crane-flies that has yet been discovered, rivalling in size species of the genera *Gnophomyia*, *Lecteria*, and *Clydonodozus*. No close relative can be pointed out by the writer.

AUSTROLIMNOBIA SPECTABILIS sp. nov.

Antennae yellow; mesonotum greenish-yellow, the lateral margins and the pleura blackish; legs yellow, the tips of the femora, tips and bases of the tibiae black; wings hyaline, the costal margin with three dark brown blotches, the third of which encloses a yellow stigmal area; wing-apex broadly dark brown; three pale brown blotches along the posterior margin of the wing.

Sex? Wing, 19·5 mm.; fore leg, femur, 12·4 mm.; middle leg, femur, 13·5 mm.; tibia, 15·8 mm.; tarsus, 10·3 mm.

Rostrum and palpi dark brown. Antennae with the scapal segments brown; flagellar segments yellow (only thirteen antennal segments remain, but the tip is evidently broken, and the full number is probably sixteen); there is no evidence of any fusion of segments at the base of the flagellum as in many Eriopterini. Head blackish (if any bloom is normally present it is destroyed in the unique type); vertex between the eyes narrow. Pronotum dark brown. Mesonotum shiny greenish-yellow, the lateral margins of the praescutum broadly blackened; scutellum and postnotum brighter, more yellowish. Pleura brownish-black. Mesosternum between the fore and middle coxae with a greenish cast. Halteres brownish-black. Legs with the coxae black; trochanters chestnut-brown; femora yellow, the tips broadly (2·2 mm.) and abruptly black; tibiae yellow, the bases and apices rather narrowly (1·5 mm.) and subequally blackened; metatarsi yellow, passing into light brown toward the tip; remainder of the tarsi brown, the terminal segment deepening into black. Wings hyaline, conspicuously variegated with dark brown, pale brown, and yellow; cell C dark brown, passing into yellow before its outer end; cell Sc alternately dark brown and yellow; a conspicuous oval yellow mark in the stigmal region, surrounded by a conspicuous semicircular dark brown mark that extends from the outer end of cell Sc across the fork of R^{2+3} and thence to the tip of R^1 and r; two conspicuous dark brown circular areas, one at the origin of Rs, the second at the fork of Rs, sending a delicate seam along the cord to the fork of Cu; wing-apex broadly dark brown, this including the ends of cells second R^1, R^2, R^3, R^5, and second M^2; along the posterior margin are three paler brown areas, extending from cell Cu^1 to cell second A, largest at the ends of veins Cu^2, second A, and before the end of vein first A, the latter narrowly connected with the brown seam at the cord; outer end of cell first M^2 very narrowly and indistinctly infuscated; veins yellow, darker in the infuscated areas. Venation: Sc^1 ending opposite the fork of R^{2+3}, Sc^1 alone being about equal to the basal deflection of Cu^1; R^1 beyond r longer than the basal deflection of Cu^1; Rs about equal to R^{2+3}; basal deflection of R^{4+5} about equal to the first section of R^2; cell first M^2 long and narrow, about as long as vein M^3 beyond it; inner ends of cells R^5, first M^2, and Cu^1 in direct alignment; m equal to the outer deflection of M^3; basal deflection of Cu^1 near the fork of M. (Abdomen broken.)

Hab. Tasmania: Waratah (A. M. Lea). Type, I. 12152.

EPIPHRAGMA Osten Sacken, 1859.

The genus *Epiphragma* had not been previously recorded from the Australasian Region.

EPIPHRAGMA TERRAE-REGINAE sp. nov.

Antennae dark brown, the first flagellar segment orange; mesonotal praescutum with the anterior half dark brown, the posterior half abruptly light yellow; legs yellow, the femora with two brown rings; tibiae with a narrow brown ring beyond the base; wings brown, the margin with darker brown areas that are narrowly bordered with light yellow.

♀ Length, 10 mm.; wing, 10·5 mm.

Rostrum brown, dusted with golden pollen; palpi dark brown. Antennae dark brown, the first flagellar segment orange; second flagellar segment pale brown; remainder of the flagellum dark brown. Head dark, dusted with brown. Pronotum extensive, fulvous brown. Mesonotal praescutum with the anterior half dark brown, beyond midlength conspicuously and abruptly covered with a light yellow pollen (scutum injured in pinning); scutellum brown, paler caudally; postnotum brown, the posterior third yellowish with a capillary dark brown median line. Pleura brown with a slightly darker ventral stripe. Halteres yellowish-brown, the knobs darker. Legs with the posterior and middle coxae conspicuously light yellow, the extreme bases dark brown; anterior coxae dark brown except at the apex; trochanters light yellow; femora yellow, before the tips with a broad (1·4 mm.) dark brown ring; a narrower post-medial brown annulus; tibiae yellow with a narrow brown ring shortly beyond the base, tips narrowly darkened; tarsi brownish-yellow, the tips darkened. Wings brown; quadrate to subcircular darker brown areas, arranged as follows: at h; bases of cells R and M; at origin of Rs; at the supernumerary cross-vein in cell C; an area at the end of Sc, continued caudad along the cord; tip of R^1 and r; tips of R^2 and R^3; these markings are conspicuously margined with yellow; slightly paler brown markings at the ends of the longitudinal veins; outer end of cell first M^2 and the fork of M^{1+2} clouded; veins dark brown. Venation: R^{2+3} about equal to the basal deflection of Cu^1; r about its own length from the tip of R^1; petiole of cell M^1 about equal to the basal deflection of Cu^1; basal deflection of Cu^1 near two-fifths the length of cell first M^2. Abdominal tergites brown, still darker brown laterally; sternites yellowish-brown, the basal sternites brighter apically.

Hab. Queensland: Cairns district (A. M. Lea). Type, I. 12153.

EPIPHRAGMA HOWENSIS sp. nov.

♂ Length, about 11·5 mm.; wing, 12 mm.; antenna, about 4·5 mm.

Generally similar to *E. terrae-reginae,* differing as follows: Antennae of the male elongate, if bent backward extending to considerably beyond the base of the abdomen; flagellar segments one to three orange-yellow; segments four to

eight yellow, the bases narrowly infuscated; remainder of the flagellum dark brown. Head with a blackish dash on either side of the vertex, adjoining the inner margin of the eye. Mesonotal praescutum with the yellow posterior half quadrilineate with dark brown; scutal lobes dark brown; scutellum light brownish-yellow with a narrow brown median line; postnotum indistinctly trilineate with brown. Pleura dark brown. Legs long and slender, yellow, unmarked with darker. Wings with the pattern nearly as in *E. terrae-reginae,* but the darker circles at the basal deflection of Cu^1, outer end of cell first M^2, and the fork of M^{1+2} deeper coloured, conspicuously margined with pale conspicuous yellow spots in the outer ends of cells R^2 to first A. Venation: R^{2+3} a little longer than the basal deflection of Cu^1; petiole of cell M^1 long, approximately twice as long as the basal deflection of Cu^1. Abdomen dark brown.

Hab. Lord Howe Island (A. M. Lea). Type, I. 12154.

LIMNOPHILA Macquart, 1834.

LIMNOPHILA PILOSIPENNIS sp. nov.

Mesonotum shiny reddish-yellow; praescutum with a narrow darker brown median stripe; pleura brownish-yellow with a conspicuous blackish area on the mesepimeron; wings yellowish-grey, the apices of the radial cells with macrotrichiae; abdomen dark brown, the basal sternites more yellowish.

♀ Length, 6·5 mm.; wing, 7·5 mm.

Rostrum greyish-pubescent; palpi dark brown. Antennae with the scapal segments dark brown; flagellar segments light brown, the outer ones becoming darker; flagellar segments oval, becoming more elongate toward the end of the organ. Head dark brown with a sparse pollen. Pronotum dark brown. Mesonotum shiny reddish-yellow, the praescutum with a narrow, darker brown median stripe. Pleura brownish-yellow; a conspicuous blackish area on the mesepimeron; mesosternum infuscated. Halteres pale brown, the apices of the knobs light yellow. Legs with the coxae yellowish-brown; trochanters dull yellow; femora brownish-yellow with an indistinct brownish ring at about one-third the length; remaining segments of the leg brownish-yellow, the tips of each very narrowly infuscated. Wings with a yellowish-grey tinge, the costal and subcostal cells and the stigma light yellow; veins light greyish-yellow. Venation: Sc long, Sc^1 ending about opposite the fork of Rs; Sc^2 a short distance from the tip of Sc^1, the latter alone about equal to the basal deflection of Cu^1; Rs long, arcuated at origin, in direct alignment with R^{2+3}; r indistinct; R^{2+3} about one-half longer than r-m; inner end of cells R^3, R^5, and first M^2 in direct alignment; cell first M^2 small, long-pentagonal; cell M^1 short, its petiole about as long as Rs; basal deflection of Cu^1 just before midlength of cell first M^2. A sparse grouping of

strong macrotrichiae in the ends of cells R^1 to M^1. Abdomen dark brown, the basal sternites more yellowish. Valves of the ovipositor long, horn-coloured.

Hab. Lord Howe Island (A. M. Lea). Type, I. 12155.

LIMNOPHILA LEAI sp. nov.

General colour dark, sparsely dusted with grey; halteres yellow; legs short and hairy; wings yellowish-subhyaline, brighter at the base, variegated with brown; wing-tip broadly infuscated; cell M^1 lacking.

♀ Length, 9·5–10 mm.; wing, 7·8–8·2 mm. Middle leg, femur, 3·6 mm.; tibia, 3·4 mm.

Rostrum and palpi dark brown. Antennae black, with sixteen segments, the basal flagellar segments pyriform, the fourth and fifth very slightly produced on their inner face, but with no indication of a pectination. Head black, sparsely brownish-grey pruinose, especially on the front and anterior portion of the vertex. Pronotum light grey-pruinose. Mesonotal praescutum dark brown, the humeral region more castaneous; remainder of the mesonotum brighter brown, especially the scutellum. Pleura heavily light grey-pruinose. Halteres yellow. Legs with the coxae light grey-pruinose; trochanters obscure yellow; legs short and conspicuously hairy; femora yellow, the slightly incrassated apical third black; tibiae yellowish-brown, the tips dark brown; tarsi black, the bases of the metatarsi a little brighter; tarsi a little longer than the tibiae; tibial spurs long. Wings yellowish-subhyaline, the base brighter; cells C and Sc brownish-yellow; three incomplete cross-bands and the wing-tip brown; the basal band occupies the bases of cells R and M, connected in cell Cu with the second band, which occupies the level of the origin of Rs, appearing as a large blotch at its origin; a large area in cells M and Cu and a small blotch near the end of cell first A; the third band occupies the level of the cord, extending from the stigma to the posterior margin, at cell first M^2 split to include both ends of the cell; wing-apex in cells R^2, R^3, R^5, second M^2 and M^3 broadly brown; veins yellow, brown in the infuscated areas. Venation: Rs angulated at origin, R^{2+3} a little longer than the basal deflection of R^{4+5}; r a little more than its own length from the tip of R^1; r-m shorter than m; cell first M^2 small, subhexagonal; cell M^1 lacking; basal deflection of Cu^1 beyond midlength of cell first M^2; vein second A sinuous, the cell broad.

Hab. Tasmania: Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 12156.

L. leai and the following species, *L. carteri*, bear a striking resemblance to species of *Gynoplistia*, and yet by the antennal structure must be referred to *Limnophila*. The discovery of the male sex should be of interest,

LIMNOPHILA CARTERI sp. nov.

General colouration dark brown; halteres with the knobs dark brown; wings faintly yellowish, conspicuously spotted and clouded with dark brown; base of cell R unmarked with brown; cell M^1 present.

♀ Length, 9·5 mm.; wing, 9·5 mm. Fore leg, femur, 6 mm.; tibia, 5·8 mm.

Generally similar to *L. leai*, differing as follows:

Halteres with the knobs dark brown. Legs longer and more slender, less hairy; femora dark brown, the basal quarter obscure yellow; tibiae and metatarsi yellowish-brown, the tips dark brown; remainder of the tarsi dark brown. Wings faintly yellowish, cells C and Sc more saturated; membrane heavily spotted and clouded with brown, arranged as follows: a small spot at about one-third the length of cell R; a large circular spot at the origin of Rs; a broad seam along the cord; conspicuous spots at the end of vein R^2, at the outer end of cell first M^2, and at the fork of M^{1+2}; conspicuous brown washes occupying most of cell M, except the base and outer end; a broad seam along vein M to the cord; wing-apex in cells R^2, R^3, R^5 and M^1 narrowly and unevenly darkened; slightly more than the basal half of cell Cu darkened, this colour also including the ends of the anal cells; veins brown. Venation: R^{2+3} about equal to the basal deflection of R^{4+5}; cell R^2 widely flaring at outer margin; cell first M^2 long-hexagonal, the basal deflection of Cu^1 before midlength; cell M^1 present, nearly one-half longer than its petiole. Abdomen dark brown, the sternites more reddish. Ovipositor with the valves long and slender, horn-coloured.

Hab. Tasmania: Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 12157.

The type is badly discoloured and there is a possibility that the head and thorax are not grey pruinose in fresh specimens, as in *L. leai*.

LIMNOPHILA EFFETA sp. nov.

Size small (wing of ♀ under 6 mm.); general colouration dark; halteres yellow; legs yellow, the femora with a narrow subterminal brown ring, tips of the tibiae and metatarsi narrowly blackened; wings yellowish-subhyaline, the stigma and anal angle faintly darkened; cell M^1 present.

♀ Length, 5·5 mm.; wing, 5·8 mm.

Rostrum and palpi dark brown. Antennal scape reddish-brown (the flagellum broken). Head dark coloured (discoloured). Mesonotum dark coloured (badly greased in the unique type); median area of the scutum more reddish. Pleura dark, grey pruinose. Halteres light yellow. Legs with the coxae obscure yellow, the fore coxae infuscated; trochanters obscure yellow; femora brownish-yellow with a narrow subterminal brown ring; tibiae and metatarsi yellow, the

tips narrowly but conspicuously blackened; remainder of the tarsi brownish-black. Wings yellowish-subhyaline, cells C and Sc slightly more yellowish; stigma slightly darker brown, ill-defined; anal angle of the wing infuscated; veins dark brown. Venation: Sc ending about opposite the fork of Rs, Sc^2 a slight distance from the tip of Sc^1, Sc^1 alone being a little longer than the basal deflection of Cu^1; Rs long, subangulated at origin, in alignment with R^{2+3}; R^{2+3} a little more than one-half R^2; r rather faint, at or immediately beyond, the fork of R^{2+3} and on R^1 nearly twice its own length from the tip; inner ends of cells R^3, R^5 and first M^2 in oblique alignment, but R^3 shorter than R^5; cell first M^2 long and narrow, widened distally; petiole of cell M^1 long, about twice the cell and approximately as long as cell first M^2; basal deflection of Cu^1 at or just beyond midlength of the latter. Abdomen dark brown. Ovipositor with the valves elongate, slender, strongly upcurved, reddish-horn-coloured.

Hab. Tasmania: Wilmot (H. J. Carter and A. M. Lea). Type, I. 12158.

L. effeta is apparently closely related to *L. disposita* Skuse (New South Wales), differing in the smaller size and in the venational details, as the length of Rs and the position of the radial cross-vein.

LIMNOPHILA PANTHERINA sp. nov.

Antennae of the male elongate; general colouration light brown, the thoracic pleura grey-pruinose; legs yellow; wings subhyaline, the costal margin yellowish, the cells spotted and dotted with brown; R^{2+3} short, r far from the tip of R^1.

♂ Length, 10·5 mm.; wing, 10·8 mm.; antenna, about 4 mm.

Rostrum brownish-yellow; palpi brown. Antennae of the male elongate, if bent backward extending to opposite midlength of the second abdominal segment; antennae brownish-yellow. Head brown. Mesonotum brown, grey-pruinose (discoloured in the type), the postnotum more testaceous. Pleura light grey-pruinose, darker on the lateral sclerites of the postnotum and on the sternum. Halteres long and slender, light brown. Legs with the coxae yellowish-testaceous; trochanters yellow; femora and tibiae obscure yellow (tarsi broken). Wings subhyaline, the costal margin light yellow, this colour extending to the wing-apex; stigmal spot small, dark brown; dark brown spots arranged as follows: at arculus; origin and fork of Rs; tip of Sc; at r; tip of R^1; R^2; a smaller spot at R^3; an interrupted seam along the cord; sparse small brown dots in all the cells of the wings excepting Sc, there being about twenty-five in cell C; veins dark brown, C, Sc, and R yellowish-brown. Venation: Sc long, extending beyond the fork of R^{2+3}, Sc^2 longer than Sc^1 and near its extreme tip; Rs long, almost straight; R^{2+3} short, about two-thirds the basal deflection of Cu^1; r very far before the tip of R^1, the ultimate section of R^1 being longer than the penultimate; r near one-

third the length of cell R^2; petiole of cell M^1 about equal to R^{2+3}; basal deflection of Cu^1 near midlength of cell first M^2, the latter slightly widened distally. Abdomen elongate, the tergites with about the basal three-fifths of each segment yellow, the apex darkened; a more or less distinct basal brown band and two impressed transverse marks near two-fifths the length of each tergite; sternites obscure yellow. Hypopygium blackened.

Hab. Victoria: Black Spur, Dividing Range, May 16, 1901 (W. Ashby). Type, I. 12159.

LIMNOPHILA (PSEUDOLIMNOPHILA) INDECORA sp. nov.

General colouration clear light grey; a narrow dark brown line from the pronotum to the base of the abdomen; praescutum with three brown stripes; femora and tibiae blackened at tips; wings yellowish-subhyaline, sparsely variegated with brown, the outer half of cell R^5 infuscated; Rs long, angulated at origin; R^{2+3} short; basal deflection of Cu^1 near the fork of M.

♀ Length, about 11·5–12·5 mm.; wing, 11·4–12·3 mm.

Rostrum dark coloured, sparsely pruinose; palpi dark brown. Antennae with the basal segment dark, greyish-pruinose; second segment reddish, slightly pruinose; flagellum dark brown. Head light grey, the middle of the vertex a little darker. Pronotum light grey, more infuscated medially. Mesonotal praescutum clear light grey with three brownish stripes, the median stripe obliterated anteriorly excepting a narrow darker median stripe that continues to the anterior margin; lateral stripes shorter; pseudosutural foveae black, very conspicuous, their surface granular; remainder of the mesonotum clear grey, the scutum and scutellum narrowly darker medially. Pleura clear grey. Halteres brown, the base of the stem yellow. Legs with the coxae light grey pruinose; trochanters reddish-yellow; femora brownish-yellow, the tips broadly blackened; tibiae yellow, the tips narrowly blackened; basal three tarsal segments brownish-yellow, the tips narrowly darkened; terminal tarsal segments dark brown. Wings yellowish-subhyaline, the costal and subcostal cells more brownish-yellow; stigma oval, dark brown; small brown spots as follows: at origin and fork of Rs; at Sc^2; tip of R^2; fork of Cu; at r-m, and at fork of M^{1+2}; apical half of cell R^5 and the tip of R^2 strongly infuscated. Venation: Sc ending a little beyond the fork of Rs, Sc^2 slightly removed from the tip, Sc^1 alone about equal to R^{2+3}; Rs long, angulated at origin; R^{2+3} shorter than the deflection of R^{4+5}; r far from the tip of R^1, the latter tip alone longer than the basal deflection of Cu^1; r on R^2 a little more than its own length beyond the fork of R^{2+3}; R^2 sinuous; r-m very reduced in size; cell first M^2 hexagonally rectangular; petiole of cell M^1 about equal to or shorter than cell first M^2 and shorter than vein M^2; basal deflection of Cu^1

immediately beyond the fork of M; vein second A long, sinuous. Abdomen dark brown, sparsely pruinose; sternites more yellowish, especially on the lateral and apical margins of each segment, sparsely pruinose; faint linear lateral dashes. Ovipositor with the valves long and slender, yellowish horn-colour.

Hab. Western Australia: Warren River (W. D. Dodd). Tasmania: King Island (A. M. Lea). Type, I. 12160.

XENOLIMNOPHILA subgen. nov.

Antennae with seventeen segments in both sexes. Wings reduced to linear pads in both sexes. Legs very long and slender, the tibiae with long spurs.

This peculiar fly is well worthy of subgeneric rank. The genus *Zaluscodes* Lamb(1) is based on *Z. aucklandicus* Lamb, a small, brownish-yellow fly from the Auckland Islands. This group and *Alfredia* Bezzi(2) are apparently degenerate species of *Limnophila,* since they possess sixteen-segmented antennae and other Limnophiline characteristics. Apparently these species, together with *L. aspidoptera* Coq. and *L. subaptera* Alex., of Western North America, have no more claim to generic rank than have the numerous subapterous species of *Tipula* and related genera. *Xenolimnophila,* however, has seventeen-segmented antennae of a rather peculiar structure, and the affinities of the group may be closer to *Gynoplistia,* in spite of the almost simple structure of the antennal flagellum.

LIMNOPHILA (XENOLIMNOPHILA) ZALUSCODES sp. nov.

Subapterous in both sexes; legs long and slender, longer in the male than in the female.

♂ Length, about 13·5 mm.; wing, 2 mm. Fore leg, femur, 13·5 mm.; tibia, 18 mm.; hind leg, femur, 13·8 mm.; tibia, 19·6 mm. ♀ Length, about 15·5–16 mm.; wing, 2 mm. Fore leg, femur, 7·9 mm.; tibia, 9·3 mm.; hind leg, femur, 8·1 mm.; tibia, 11·4 mm.

Rostrum and palpi dark brown. Antennae seventeen-segmented, moderately elongate, dark brown, the scapal segments more reddish; flagellar segments subcylindrical, the inner face a little produced. Head reddish-brown, narrowed behind. Mesonotum reddish-brown, the praescutum with two narrow darker lines; pleura sparsely pruinose. Thorax small, the dorsum flattened as in most subapterous Tipulidae. Halteres yellow, the knobs dark brown. Legs of the male much longer than in the female, as shown by the above measurements, giving the insect a spider-like appearance; coxae long and prominent, heavily

(1) Lamb, Subantarctic Islands of New Zealand, 1, 1909, p. 130.

(2) Bezzi, Atti Soc. Ital. Sci. Nat., lvii, 1918, p. 20-22.

dusted with grey; tibiae very long, longer than the femora; tibial spurs long and slender. Wings yellow, reduced to mere strap-like lobes with no distinct venation, a little longer than the halteres. Abdomen dark brown, lighter coloured in the female. Male hypopygium with the pleurites short and stout; pleural appendages two, relatively small and slender. Ovipositor with the valves long and powerful, blackened at the base, the apical half of the valves paler.

Hab. Tasmania: Waratah (H. J. Carter and A. M. Lea). Type, I. 12161.

CEROZODIA Westwood, 1835.

CEROZODIA FLAVIPES sp. nov.

Size large (wing of female over 20 mm.); tarsi light yellow; mesonotum brownish-grey in the male with three dark brown stripes; in the female more reddish-brown with the stripes less distinct.

♂ Length, about 17 mm.; wing, 16·2 mm.; antenna, about 10 mm.
♀ Length, 25–26 mm.; wing, 21·5 mm.; antenna, about 7 mm.

♂ Rostrum reddish-brown; palpi dark brown, Antennae with 25 segments; flagellar segments 1 to 21 with very long flabellations, the terminal two segments simple; the branches at about midlength of the organ are longest (about 2·6 mm.), shorter on the basal and terminal pectinated segments; scape light brown, the flagellum and branches dark brown. Head dark brownish-grey. Mesonotum brownish-grey with three dark brown stripes, the median stripe entire; remainder of the mesonotum dark brown, the scutellum a little more reddish. Pleura dark, heavily grey-pruinose; dorso-pleural membranes obscure yellow. Halteres light yellow, the knobs dark brown. Legs with the coxae dark, grey-pruinose; trochanters brownish-yellow; femora brown, the base paler, the tip narrowly yellowish, preceded by an indistinct darker ring; tibiae light brown, the tips narrowly darkened; metatarsi except the tip and the terminal tarsal segment brown; remainder of the tarsi light yellow. Wings whitish-subhyaline, the wing-base and cells C and Sc more yellowish; a heavy dark brown pattern as follows: a more or less distinct area at the base of cell R; a large spot at one-third the length of cell R; at origin of Rs; at the stigma, continued obliquely backward along the cord to the fork of M; a rounded spot at the tip of R^2; less distinct clouds along the cord; outer end of cell first M^2; fork of M^{1+2}; along veins M and R^{4+5}; brownish washes in cells M, Cu^1, the distal half of R^5, and near the ends of the anal cells. Venation: Sc long, Sc^1 extending to slightly beyond the fork of R^{2+3}; r near mid-distance between the fork of R^{2+3} and the tip of R^1; R^{2+3} a little shorter than the arcuated deflection of R^{4+5}; petiole of cell M^1 shorter than cell first M^2; basal deflection of Cu^1 at about two-fifths the length of cell first M^2. Abdomen reddish-brown, sparsely pruinose, the caudal

margins of the basal segments and the entire distal tergites darker brown; sternites reddish-brown, sparsely pruinose.

♀ The females referred to this species agree in the general features of size and colour. The number of antennal segments is twenty in one specimen, twenty-one in the other; of these, only the basal five flagellar segments bear a short, subterminal serration. The mesonotum is more reddish-brown, with the praescutal stripes ill-defined. Legs darker, the pale femoral tips less clearly indicated. Wings with the brown spots more clearly defined; the brown washes in the medial and anal cells more restricted. Ovipositor with the valves slender, dark brownish-black. In the paratype female, the median praescutal stripe is reddish, split by a capillary dark brown line; legs indistinctly reddish. It is possible that more than a single species is involved in this group.

Hab. Tasmania: Hobart and Waratah (A. M. Lea); Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 12162.

CEROZODIA MINUSCULA sp. nov.

Size small (wing of female under 15 mm.); general colouration light grey, the praescutum with conspicuous black stripes; wings whitish-subhyaline, conspicuously spotted with brown.

♂ Length, 10·5 mm.; wing, 11·3 mm. ♀ Length, 12·5 mm.; wing, 12·4 mm.

Rostrum light grey pruinose; palpi dark brown. Antennae dark, the first segment greyish-pruinose; first flagellar segment of the male with a long, black flabellation (remainder of the antenna broken); in the female there are only fifteen antennal segments, the basal five segments with a moderately long branch on the inner face before the apex; terminal flagellar segments cylindrical. Head grey. Pronotum grey. Mesonotal praescutum light grey with three black stripes, the broad median stripe conspicuously split by a capillary grey line; pseudosutural foveae conspicuous, subrectangular in outline; scutum grey, each lobe with the centre blackened; scutellum grey; postnotum greyish, darker posteriorly. Pleura light grey; a slightly darker dorsal longitudinal stripe; mesosternum slaty-grey. Halteres yellow, the knobs dark brown. Legs with the coxae yellowish, grey pruinose, heaviest on the posterior coxae; trochanters obscure yellow; femora yellow, the tips broadly blackened; tibiae yellowish-brown, the tips broadly dark brown; metatarsi brownish-yellow (remainder of the tarsi broken). Wings whitish-subhyaline, the costal and subcostal cells solidly infuscated, cell Sc^1 largely pale; stigma oval, dark brown; conspicuous brown clouds as follows: at one-third the length of cell R; at origin of Rs; at the tip of R^2 and a seam along the cord; paler brownish-grey seams along most of the longi-

tudinal veins, at the outer end of cell first M^2; at the fork of M^{1+2}, and at the end of cells Cu^1, first A, second A, and in the wing-axil; extreme base of the wing yellow. Venation: Rs angulated or slightly spurred at origin; R^{2+3} about equal to the deflection of R^{4+5}; r on R^2 a little more than its own length beyond the fork of R^{2+3}; petiole of cell M^1 equal to or slightly longer than cell first M^2; basal deflection of Cu^1 before midlength of cell first M^2. Abdomen dark brown, the basal sternites more yellowish, sparsely grey pruinose. Ovipositor with the tergal valves long and slender, only slightly upcurved.

Hab. Tasmania: Wilmot (H. J. Carter and A. M. Lea). Type, I. 12163.

GYNOPLISTIA Westwood, 1835.

GYNOPLISTIA BELLA PALLIDAPICALIS subsp. nov.

♂ Length, 9–10 mm.; wing, 9 mm.

Very similar to typical *G. bella* Walker, differing as follows:

Male antenna with twenty segments, the terminal five simple. Wings with the apical dark band reduced to an indistinct cloud in the ends of cells R^2 to R^5; the white spot in cell R is very small, much smaller than the white blotch beyond the origin of Rs.

This is the variety *B* mentioned by Skuse, his material having also been secured in Tasmania.

Hab. Tasmania: Cradle Mountain (H. J. Carter and A. M. Lea).

STIBADOCERELLA Brunetti, 1918.

The genus *Stibadocerella* was erected by Brunetti for the Oriental *S. pristina* Brunetti. It is of great interest to record a second species, the first member of the Cylindrotominae to be found in the Australasian Region. Although the type is in a highly fragmentary condition, there will be no doubt of the identity because of the conspicuous diagnostic characters listed under the species. The present form deviates from the original characterization of the genus by the long vein R^{2+3}, r-m being placed at the fork of the sector. The chief character still available for the separation of *Stibadocerella* from *Stibadocera* Enderlein would thus seem to be the impunctate head and thorax. The white tarsi are likewise a conspicuous character, though shared by the Oriental genus *Agastomyia* de Meijere (1919). This latter genus differs from all other known Tipulidae, with the exception of the Limnobiine *Doaneomyia* Alexander, in the possession of a single anal vein.

STIBADOCERELLA TASMANIENSIS sp. nov.

General colouration yellowish; mesonotal praescutum reddish-brown, impunctate; a conspicuous transverse brown stripe on the mesopleura; legs brown,

the tarsi largely white; wings with a strong brownish tinge; a few macrotrichiae in the cells near the wing-tip; r-m at the fork of Rs, R^{2+3} long and sinuous.

♂ Wing, 8·2 mm.; antenna, about 10·5 mm.

Rostrum and palpi brownish-yellow. Male antennae very long; scape obscure yellow; flagellar segments brown, each provided with abundant long erect hairs. Front obscure yellow; vertex broad, dark brown. Pronotum light yellow. Mesonotal praescutum reddish-brown, impunctate; remainder of the mesonotum reddish-testaceous. Pleura obscure yellow with a broad transverse dark brown mark across the mesopleura, extending from the lateral margins of the praescutum to the mesosternum between the fore and middle coxae. Halteres brown (the knobs broken). Legs with the coxae and trochanters obscure yellow; femora brown, the bases paler; tibiae and metatarsi dark brown; tarsal segments three and four, and the apex of two, white; last tarsal segment slightly infuscated. Wings with a strong brownish tinge; no stigma; veins dark brown; a few macrotrichiae in the apices of cells R^5, second M^2, and M^3. Venation: Sc long, ending about opposite two-fifths the long Rs, Sc^2 at the tip of Sc^1; Rs long, the basal third subsinuous; r-m at the end of Rs, R^{2+3} being very long, gently sinuous; no trace of the tips of veins R^1 or R^2; r-m long, about one-half as long as cell first M^2; basal deflection of Cu^1 at midlength of cell first M^2. (Abdomen broken.)

Hab. Tasmania: Hobart (A. M. Lea). Type, I. 12165.

BRACHYPREMNA Osten Sacken, 1886.

BRACHYPREMNA(?) TIGRIVENTRIS sp. nov.

General colouration dark brown, the mesonotum without distinct markings; head dark brown, narrowly yellowish adjoining the eyes; wings faintly brownish, stigma dark brown, followed and preceded by a subhyaline area; vein second A running very close to the anal angle of the wing; abdominal tergites dark brown, the sternites yellowish, the segments margined caudally with dark brown.

♀ Length, 14·5 mm.; wing, 15 mm.

Frontal prolongation of the head reddish-brown; nasus long and slender, black, dusted with grey, tipped with long, black bristles. Antennae brown, apparently only ten-segmented; flagellar segments gradually decreasing in length. Head dark brown, narrowly yellowish adjoining the margin of the eyes. Mesonotal praescutum, scutum and postnotum dark brown, without distinct stripes or markings of any kind (scutellum destroyed in pinning). Pleura light brown, sparsely variegated with darker areas, more conspicuous on the lateral sclerites of the postnotum. Halteres moderately elongated, brown, yellow at the base of the stem, the knobs dark brown. Legs with the coxae light brownish-

testaceous; trochanters brownish yellow (remainder of the legs broken). Wings with a brownish tinge; stigma oval, dark brown; subcostal cell a little darker than the remainder of the wing; cord and longitudinal veins beyond it indistinctly clouded and seamed with brown; conspicuous whitish-subhyaline areas before and beyond the stigma; veins brown, tips of veins M^2, M^4 and Cu^1 pale at the wing-margin. Venation: Sc long, Sc^1 ending about opposite two-fifths the length of R^{2+3}; Sc^2 a little removed from the tip of Sc^1; the distance on costa between the tips of Sc^1 and R^1 is about two-thirds of r; Rs moderately long, gently arcuated; R^{2+3} a little shorter than Rs; R^2 nearly at right angles to R^{2+3} at the fork, r joining near its base; petiole of cell M^1 shorter than m; m-cu obliterated by fusion of Cu^1 and M^{3+4}; vein second A running very close to and parallel with anal angle of wing, cell second A consequently very linear and of nearly uniform width for its entire length. Abdominal tergites brown, the caudal margin of the segments ringed with black, this including about the apical fourth of each segment; lateral regions of the tergites more yellowish; sternites yellow, the caudal margins of the segments narrowly and conspicuously banded with dark brown. Ovipositor yellowish horn-colour; tergal valves compressed, the apices bluntly rounded; sternal valves a little shorter than the tergal valves, the tips acute.

Hab. Queensland: Cairns district (A. M. Lea). Type, I. 12166.

The reference of this fly to the genus *Brachypremna* is entirely provisional. All of the known existing species of the genus are American. Several features of structure and colour of the present insect point strongly to *Brachypremna,* and it is placed therein until more material becomes available.

CLYTOCOSMUS Skuse, 1890.

CLYTOCOSMUS SKUSEI sp. nov.

General colouration black, the mesonotum lined with silvery grey; pleura spotted with white, a triangular orange area before the wing-root; wings reddish-brown, the base brighter; abdomen black, the basal half of tergite two, all of tergites seven to nine, and the sternites orange.

♂ Length, 21 mm.; wing, 19–20 mm. Fore leg, femur, 9·3 mm.; tibia, 9·8 mm.; metatarsus, 4·5 mm.; remainder of fore tarsi, 7 mm.; middle leg, femur, 11·5 mm., tibia, 9·9 mm., metatarsus, 4·7 mm., remainder of middle tarsi, 8 mm.; hind leg, femur, 12 mm., tibia, 12·9 mm., metatarsus, 6·3 mm., remainder of hind tarsi, about 8 mm.

Head fiery-orange; palpi brownish-black. Antennae with the basal segment orange; remainder of the organ black; the first seven flagellar segments dilated into a cordiform structure, the branches being short and inconspicuous, much

shorter than in this sex of *C. helmsi*; segment two of the flagellum largest, thence gradually decreasing in size to the seventh; eighth flagellar segment slightly enlarged; terminal segments long-cylindrical with conspicuous verticils. Pronotum velvety-black. Mesonotal praescutum silvery-grey with three conspicuous velvety-black stripes that restrict the ground-colour to narrow lines; median stripe narrowed behind, cuneiform, anteriorly split by a very indistinct grey line; lateral stripes but narrowly separated from the median stripe; lateral margins of the sclerite narrowly blackened; scutal lobes grey, each lobe with the centres black, circled with grey; median area of the scutum and lateral margin of each lobe narrowly blackish; scutellum grey with a median black stripe; postnotum black with an anterior median grey spot. Pleura brownish-black, conspicuously variegated with white spots, these on the mesepisternum, mesepimeron, dorsal margin of the mesosternum, and the lateral sclerite of the postnotum before the origin of the halteres; propleura narrowly white; a white spot above the hind coxa; a conspicuous orange triangular area on the dorsal pleurites immediately caudad of the anterior spiracle and before the wing-root. Halteres black, the bases a little paler. Legs with the coxae conspicuously light grey pruinose; remainder of the legs black; claws of the male with two small teeth beneath. Wings with a strong reddish-brown tinge, much darker than in *C. helmsi* or *C. tillyardi*, brighter at the wing-base and in the costal and subcostal cells; cells M, Cu^1 and first A with small triangular paler centres. Abdominal tergites velvety-black, the basal half of segment two and segments seven to nine orange; the black tergites each have a conspicuous circular white spot at the lateral ends, and tergites two to five have an additional submedian spot near the anterior margin on either side; sternites fiery-orange, the caudal margins of segments four to six very narrowly blackish-brown.

Hab. New South Wales: Dorrigo. Type, I. 12167.

This magnificent crane-fly is dedicated to the late Frederick A. A. Skuse, the great pioneer student of Australian Tipulidae, author of the genus *Clytocosmus*. If it were not for the constancy between the sexes of *C. helmsi* Skuse as regards body colouration, I would have regarded this fly as representing the male sex of *C. tillyardi* Alexander; however, the colouration of the thorax of the two species is so nearly diametrically opposite that I cannot believe that they represent a single species. More material will settle the status of this fly. *C. lichtwardti* Riedel, recently described (1) from North Queensland, also has the colouration similar in the two sexes.

(1) Riedel, Arch. f. Naturgesch., lxxxv, 1920, p. 85-88.

PTILOGYNA Westwood, 1835.

PTILOGYNA MINIMA sp. nov.

Size small (wing of male 12 mm.); head and thorax light yellow; wings pale brown, the base and costal margin more saturated; abdomen yellow, the tergites trivittate with brownish-black.

♂ Length, 13·2 mm.; wing, 12 mm.; antenna, 5·8 mm. ♀ Length, 14·5 mm.; wing, 11·3 mm.

Frontal prolongation of the head rather short, light yellow, infuscated laterally and beneath; palpi dark brown. Antennae yellow, the long branches dark brown. Head yellow, duller on the posterior portions of the vertex. Mesonotum dull yellow, the praescutum slightly darker medially. Pleura yellow. Halteres light brown, the knobs dark brown. Legs with the coxae and trochanters obscure yellow; remainder of the legs brown, the femora paler basally. Wings with a pale brownish tinge, the base and costal margin more saturated; no distinct whitish spots as in *P. ramicornis* (Walker). Venation: Third section of vein M^{1+2} longer than the second section (M^{1+2} plus R^{4+5}); R^{2+3} about twice R^2; veins dark brown. Abdomen yellow, the tergites with a broad dark brownish-black median stripe; lateral margins narrowly dark brown; sternites brownish-yellow.

Hab. Northern Territory: Melville Island (W. D. Dodd). Type, I. 12168.

This tiny *Ptilogyna* is abundantly distinct from the widely distributed *P. ramicornis* (Walker).

PHACELODOCERA Enderlein, 1912.

The genus *Phacelodocera* was based on *Ptilogyna flabellifera* Loew, of Brazil. In this group the antennae are very similar to those of *Ptilogyna*, but the details of venation are almost exactly as in *Plusiomyia*, r-m and the petiole of cell M^1 being present. The species here described is the second of the genus to be made known.

PHACELODOCERA TASMANIENSIS sp. nov.

Antennae with long flabellations; wings with a heavy brown pattern, streaked with hyaline; r-m and the petiole of cell M present; abdomen reddish, grey pruinose, the lateral margins blackish.

♂ Length, about 28 mm.; wing, 25 mm.; antenna, about 10 mm.; abdomen alone, 18·5 mm. Fore leg, femur, 14·7 mm.; tibia, 16·5 mm.; hind leg, femur, 15·8 mm.; tibia, 16·6 mm.

Frontal prolongation of the head long and slender, about as long as the remainder of the head, reddish, the dorsal half brown; mouth parts dark brown,

Antennae comparatively long, the first flagellar segment with a single long (about 3 mm.) flabellation; flagellar segments two to nine with three long flabellations, a pair of divergent, stronger, basal branches, the longest being about 4 mm. in length, and a more slender branch of subequal length just beyond midlength of the segment on the same face; the branches toward the end of the segment are shorter; the apical segments of the antenna taken together are a little longer than the terminal branch; first segment of the scape brown; remainder of the organ black. Head dark brown, the occiput more reddish. Pronotum reddish, grey pruinose. Mesonotal praescutum reddish, greyish-white pruinose, with three dark grey stripes that are indistinctly margined with darker; remainder of the mesonotum reddish, sparsely light grey pruinose. Pleura reddish, with a longitudinal stripe covered with a silky-grey bloom, the dorsal sclerites and the mesosternum darker brown to produce two longitudinal stripes that enclose a broad grey one. Halteres dark brown. Legs with the coxae reddish-brown, light grey pruinose; femora reddish-brown, the tips dark brown; tibiae and metatarsi reddish-brown, the tips narrowly blackened; tarsi blackish. Wings dark brown, the costal, subcostal and base of the radial cell somewhat brighter; anal cells more greyish; the wing is variegated with whitish-hyaline, the pattern being strikingly like that of *Plusiomyia pandoxa*; a large hyaline blotch on the outer half of cell M; cell first M^2 hyaline, sending forth three interrupted rays; a narrow one obliquely to the costa across the bases of cells R^2, R^3, R^5 and the extreme tip of cell second R^1; the second ray includes almost all of cell R^5 excepting a narrow brown interruption at about one-third the length of the cell; the third ray is broad and includes only the basal portions of cells second M^2 and M^4; cell Cu^1 is dark, only the centre being indistinctly paler; cell Cu hyaline, the base dark brown, the apical third greyish, enclosing an oval hyaline area; anal cells broadly hyaline basally, greyish-brown apically, a narrow hyaline ray in cell first A near vein second A continued to the anal margin. Venation: r-m longer than m-cu; petiole of cell M^1 a little shorter than m. Abdomen reddish, the tergites beyond the second greyish-pruinose, except dorso-medially and laterally; lateral margins of the segments broadly blackened, these areas narrow anteriorly, broadened behind; a broad dark brown dorso-median stripe, this interrupted at the posterior margin of each segment; sternites reddish-brown, sparsely pruinose.

Hab. Tasmania: Waratah (H. J. Carter and A. M. Lea). Type, I. 12169.

PLUSIOMYIA Skuse, 1890.

PLUSIOMYIA PANDOXA sp. nov.

Mesonotum dark grey, the praescutum with four dull violaceous stripes; a narrow arcuated brown band across the scutellum; pleura silky-grey with three

narrow dark brown longitudinal stripes; wings dark brown; a whitish-subhyaline area in the outer end of cell M that splits into three rays at cell first M^2, one going to costa in cell R^2, one to the wing-tip in cell R^5, the third to the posterior margin in cell M^4; lateral margins of the abdominal tergites dark brown.

♂ Length, 26-30 mm.; wing, 25-27 mm.; abdomen alone, 17-21 mm.

Frontal prolongation of the head reddish; palpi dark brown. Antennae with the scapal segments reddish, the flagellum dark brown; first flagellar segment produced strongly ventrad at apex; pectinations of flagellar segments two to seven about one-half longer than the segments. Head reddish-purple, the anterior portion of the vertex and a broad margin adjoining the eyes light grey. Pronotum light grey, cinnamon-brown medially. Mesonotal praescutum dark grey with four rather narrow dull violaceous stripes, the intermediate pair separated by a narrow line of the ground-colour; scutum grey, the lobes largely dull violaceous; a narrow dark chestnut band extends from each wing-root across the posterior part of the scutellum; postnotum pale grey pruinose, the posterior margin of the median sclerite and the ventral half of the lateral sclerites above the halteres chestnut. Pleura and sternum with a light grey silky bloom, with three more or less evanescent narrow chestnut-brown longitudinal stripes, the most dorsal one occupying the dorso-pleural membranes; the second, broadest, extending from the ventral ends of the propleura above the fore coxae to the base of the halteres; the most ventral stripe occupying the mesosternum; the area between the ventral and intermediate stripes is broader than the latter; these dark stripes are best seen when the insect is viewed from before; viewed from behind they are quite invisible. Halteres brown, the knobs obscure brownish-yellow. Legs with the coxae reddish, light grey pruinose; trochanters dark reddish-brown; femora reddish, the tips indistinctly darkened; tibiae obscure brownish-yellow, darkened apically, the extreme tips indistinctly infuscated; tarsi brown. Wings dark brown, the costal and subcostal cells more yellowish-brown; cells Cu, first A and second A more greyish, subhyaline basally; a large oval whitish-subhyaline area in cell R before the origin of Rs; a large blotch occupying the outer half of cell M, passing through cell first M^2 and there splitting into three rays, the first narrow, traversing the bases of cells R^2 and R^3; the second including most of cell R^5 and the extreme tip of R^3, the third including the base of cell second M^2 and all of M^4 except the anterior outer angle; thus there appears an outer longitudinal white stripe, crossed by an arcuate similar band that extends from margin to margin; cell Cu^1 grey, the surrounding veins heavily margined with dark brown. Wings broader than in *P. gracilis*. Venation: Cell M^1 short-petiolate. Abdomen reddish; lateral margins of the tergites broadly dark brown. Male hypopygium of simple structure.

Hab. Tasmania (A. Simson, No. 3846). Type, I. 12170.

PLUSIOMYIA TRIPECTINATA sp. nov.

Similar in general appearance to *P. pandoxa*; flagellar segments two to six with a slender pectination beyond midlength of each segment, in addition to the usual basal pair; wing-pattern heavier, especially in the anal cells.

♂ Length, 25 mm.; wing, 24·5–26 mm.; abdomen alone, 18 mm.

Very similar in general appearance to *P. pandoxa,* differing as follows:

Basal flagellar segment with a slender finger-like lobe immediately before the tip; segments two to six, in addition to the slender basal branches, with a shorter but conspicuous third branch just beyond midlength of the segment; seventh flagellar segment without the apical branch and apparently with but a single basal branch. Stripes on the praescutum duller grey. Wings narrower; the wing-pattern very similar to that of *P. pandoxa,* the chief differences as follows: The white band in cell R^5 is narrowly interrupted by a brown line before the fork of M^{1+2}; the posterior ray from cell first M^2 does not reach the posterior margin, but ends at near midlength of cell M^4; outer ends of the anal cells brownish-grey, heaviest along vein second A; a whitish ray in cell first A reaching the wing-margin near vein second A; cell Cu hyaline with the distal end and a mark at two-thirds the length narrowly brown. Abdomen shorter, the lateral margins darker.

Hab. Tasmania: Magnet, Waratah (A. M. Lea). Type, 12171.

The antennal structure is very distinct from that in other members of the *gracilis* group.

PLUSIOMYIA (?) FELIX sp. nov.

Mesonotum light grey, the praescutum with three reddish-brown stripes; a conspicuous tubercle on the lateral sclerite of the postnotum before the root of the halter; wings greyish-subhyaline, the cord and longitudinal veins narrowly seamed with brown; abdominal tergites reddish-brown, the lateral margin of each segment with silver-grey triangles.

♂ Length, 26 mm.; wing, 24·3 mm.

Frontal prolongation of the head reddish; palpi dark brown. Antennae with the scapal segments reddish-brown (flagellum broken). Head with the vertex behind the antennal bases shiny-reddish; remainder of the vertex dusky-grey, a little more reddish adjoining the inner margin of the eyes. Mesonotal praescutum light grey with three conspicuous reddish-brown stripes that are weakly pruinose; median stripe split by a capillary line of ground-colour except at the posterior end; scutal lobes and lateral margins of the scutellum largely reddish; median area of scutum and scutellum light grey-pruinose; postnotum reddish,

heavily light grey-pruinose. Lateral sclerites of the postnotum immediately before the root of the halteres produced laterad into conspicuous tubercles. Pleura light grey-pruinose; a reddish triangle on the mesepisternum; mesosternum reddish. Halteres brown, the knobs light yellow. Legs with the coxae light grey; trochanters reddish-brown; femora reddish-brown, the tips narrowly blackish (remainder of the legs broken). Wings greyish-subhyaline; cell C more yellowish; cell Sc narrow, fulvous; stigma pale yellowish-brown; cord seamed with brown; longitudinal veins very narrowly seamed with brown, broader on M. Venation: As in *P. pandoxa;* vein R^3 longer than Rs; R^{4+5} strongly sinuated at midlength; petiole of cell M^1 about equal to r-m; cell first M^2 shorter, the basal deflections of M^{1+2} and M^{3+4} subequal. Abdominal tergites reddish-brown with the lateral margins conspicuously silvery-grey; median line duller grey; tergite one entirely dull grey; the lateral triangles are most distinct on segments two to seven; the dorso-median grey line is narrowly interrupted at the posterior margins of the segments; sternites reddish, sparsely grey pruinose.

Hab. Tasmania (A. Simson, No. 3262). Type, I. 12172.

The reference of this crane-fly to *Plusiomyia* is rendered somewhat doubtful by the loss of the antennae. However, the other details of structure agree, and it is highly probable that the above reference is correct.

PLUSIOMYIA MINOR sp. nov.

Size small (wing of female under 13 mm.); general colouration dark brown, the thorax without distinct stripes; first scapal segment very long and slender; flagellar segments two to seven with a pair of basal branches and a smaller blunt subterminal branch; wings greyish-subhyaline, unmarked; abdomen brownish-black.

♀ Length, about 12 mm.; wing, 12·6 mm.

Frontal prolongation of the head slender, only a trifle longer than the remainder of the head, reddish-brown, passing into dark brown at the tip; palpi dark brown. Antennae with the first scapal segment long and slender as in *P. inornata,* about as long as the frontal prolongation of the head or nearly one-third of the entire antennal length; first flagellar segment with an apical triangular tooth; flagellar segments dark brown; segments two to seven branched, the longest branch scarcely a third longer than the segment that bears it; the minute third branch of each of these six flagellar segments is situated just before the tip of each segment; terminal six segments of the flagellum simple. Head dusky grey; vertex between the eyes narrow. Mesonotum rather dark brown without distinct stripes. Pleura dark brownish-testaceous without markings. Halteres brown, the knobs dark brown. Legs with the coxae and trochanters

brownish-testaceous; remainder of the legs darker brown. Wings greyish-subhyaline, unmarked with darker; cell Sc and the stigma a little darker; veins brown. Venation: Rs and R^{2+3} subequal in length; cell M^1 broadly sessile; cells M^1, second M^2 and M^4 parallel and approximately subequal in length and breadth. Abdomen brownish-black, probably with a brown bloom in fresh specimens. Ovipositor with the valves dark brownish horn-colour.

Hab. North Queensland: Cairns district (A. M. Lea). Type, I. 12173.

P. minor is the smallest species of the genus known. It is closest to *P. inornata* Skuse, and belongs to this group or subgenus. It differs from *inornata* in its very small size, the shorter flagellar pectinations, and the details of colouration.

PLUSIOMYIA SPISSIGRADA sp. nov.

Female subapterous; wings considerably atrophied both in length and breadth.

♀ Length, about 33 mm.; wing, 12 mm.; abdomen alone, excluding the ovipositor, about 22 mm.

Frontal prolongation of the head moderately elongated, a little longer than the remainder of the head, with no indication of a nasus, reddish-brown in colour; mouth-parts darker. Antennal scape dark brown (flagellum broken). Head dark grey, narrowly paler adjoining the inner margins of the eyes. Pronotum very thin, deep reddish-brown. Mesonotal praescutum testaceous-brown with a dark brown median stripe, the median line of the praescutum with a distinct, shallow, longitudinal fovea; lateral stripes obscure yellow, darker laterally; scutum brown, the median area and inner portions of the lobes obscure yellow; scutellum brown, the posterior half of the median lobe yellowish; postnotum reddish-brown; lateral sclerites of the postnotum more pruinose; a conspicuous transverse ridge across this sclerite before the halter, as in the genus. Pleura reddish-brown, the mesepimeron and lateral sclerite of the postnotum more yellowish. Halteres brownish-yellow. Legs with the coxae and trochanters reddish-brown; femora reddish-brown, becoming dark brown at the tips (remainder of the legs broken). Wings considerably atrophied both in length and breadth so as to render the fly incapable of flight, the venation correspondingly distorted; wings dirty grey, the basal and costal regions more yellowish. Venation: Costa twice bellied outward, more strongly so opposite the stigmal region; cell M^1 entirely sessile; veins stout, the cells correspondingly reduced. Abdomen large and filled with eggs, dark reddish-brown; pleural region duller (the tips of the ovipositor are broken, but the shields of both valves are dark shiny brown).

Hab. Tasmania: Frenchman's Cap (J. E. Philp). Type, I. 12174.

In spite of the fact that the antennal flagella are broken and that the wing-venation is distorted by the atrophy of the wing, there can be scarcely any doubt that the generic reference as given is correct. The peculiar shape of the head and the strong transverse ridge on the lateral sclerites of the postnotum are well-defined characters of *Plusiomyia*. The discovery of nearly apterous members of this genus is of exceptional interest.

PLUSIOMYIA NECOPINA sp. nov.

Female subapterous; wings reduced to mere strap-like organs.

♀ Length, about 24 mm.; wing, about 5·5 mm.; abdomen alone, 19 mm.

Frontal prolongation of the head slightly longer than the remainder of the head, brown; basal segments of palpi more yellowish; remainder of mouth-parts darker brown. Antennae (broken beyond the scape), first scapal segment dull yellow, tipped with darker; second segment yellow. Head with a light yellow pollen; vertex and occiput with a conspicuous dark brown area that restricts the ground-colour to margins adjoining the eyes; this dark mark on the vertex broadens out toward the occiput. Pronotum not so thin and plate-like as in *P. spissigrada*, brown, darker medially. Mesonotal praescutum light yellowish-brown with three darker brown stripes; scutum brown, the median area paler (scutellum badly injured in pinning); postnotum light coloured, slightly pruinose; the ridge on the lateral sclerites of the postnotum occurring in this genus scarcely evident. Pleura pale brown, sparsely grey pruinose. Halteres pale brown, the knobs darker brown. Legs with the coxae pale greyish-brown; trochanters obscure yellow; femora light brown, more yellowish basally (the tips broken). Wings brown, short, and so narrow as to appear strap-like; venation so crowded as to be scarcely apparent; the region of the arculus is beyond one-third the wing-length. Abdomen obscure brownish-yellow, the tergites with two parallel narrow dark brown stripes that are more or less interrupted, the space between about equal in width to one of them; sternites obscure yellow, the basal half of the segments slightly darker, pleural membrane darker brown. Ovipositor with the valves powerful, shiny dark brown; tergal valves slender, lying transversely, the lateral margins feebly serrulate, the tips slightly expanded; sternal valves very large and powerful, nearly black, much stronger than the tergal valves, the two together appearing like a long acute point; the structure of the tergal valves is much like that found in the *arctica* group of the genus *Tipula*, but the sternal valves are very different, being as large and powerful as any other species of Tipulid known to the writer.

Hab. Tasmania: Gladstone (J. E. Philp). Type, I. 12175.

PHYMATOPSIS Skuse, 1890.

PHYMATOPSIS BREVIROSTRATA sp. nov.

Antennae with twelve segments in the male; flagellum brown; mesonotum obscure yellow, the praescutum with three broad blackish stripes that are confluent, or nearly so; wings whitish-subhyaline with conspicuous brown cross-bands; Rs short; abdomen black, the tergites with yellowish bases in the male, more greyish in the female.

♂ Length, 7·5–8 mm.; wing, 9–10·8 mm. ♀ Length, 10 mm.; wing, 9 mm.

Frontal prolongation of the head short and stout, strongly arched at about midlength; no distinct nasus, but a tuft of four or five bristles at this point; palpi dark brown. Antennae rather short, twelve-segmented in the male; first flagellar segment pyriform; remaining segments gradually decreasing in size, but increasing in length to the terminal one; scape obscure yellow, flagellum brown. Head yellowish-grey, the vertex with a large triangular brown blotch. Mesonotal praescutum obscure yellow with three broad blackish stripes that are confluent or nearly so, the median stripe very narrowly split by a capillary pale line; scutal lobes black; scutellum yellowish-testaceous; postnotum dark brown, blackish posteriorly, this colour continued laterad on to the lateral sclerites of the postnotum and appearing as a large blotch before the root of the halter. Pleura pale brownish-yellow, sparsely pruinose. Halteres dark brown, the basal half of the stem light yellow. Legs with the coxae and trochanters light yellow; femora yellowish-brown, the tips narrowly blackened; tibiae dark brown, the tips blackened; tarsi black. Wings whitish-subhyaline with cross-bands of brownish; cells C and Sc more yellowish; stigma dark brown, suffusing all of cell Sc^1 and the outer half of first R^1, continued caudad as a broad seam along the cord to the fork of M; broad brown cross-bands in the basal cells, one at the arculus; the second near midlength of the basal cells; wing-apex and the posterior and anal cells greyish-brown; the conspicuous whitish bands left are before and beyond the cord and near the wing-base. Venation: Rs short, arcuated at origin, shorter than R^{2+3}; petiole of cell M^1 shorter than r-m; cell second A very narrow; Cu^2 about twice the deflection of Cu^1. Abdominal tergites two to six obscure yellow, the caudal margins broadly black, the remaining tergites black; lateral margins broadly greyish-yellow; sternites brownish-yellow.

The female referred to this species is much darker in colour, the black including the entire thorax; the wing is more uniformly darkened, the band at the cord being very broad, restricting the white markings before and beyond the cord to small oval areas; cell second A broader; bases of abdominal tergites more greyish than yellow.

Hab. New South Wales: Dorrigo (W. Heron). Type, I. 12176.

Although this handsome little fly deviates in some important respects from the definition of *Phymatopsis* there is no other group that can receive it, and it seems best to place it in the present genus, although, like *P. brevipalpis* Alexander, it is aberrant in several points.

SEMNOTES Westwood, 1876.

SEMNOTES REGIFICA sp. nov.

General colouration yellow; mesonotal praescutum with three confluent transverse black stripes that do not attain the suture; legs black, the tibiae with a broad yellow ring beyond the base; wings dark brown, a conspicuous yellow band at the base of the wing and an oval yellow spot near the origin of Rs.

♀ Length, about 22 mm.; wing, 29·5 mm.; fore leg, femur, 12·2 mm.; tibia, 16·4 mm.; metatarsus, 20·5 mm.; middle leg, femur, 15 mm.; tibia, 16·3 mm.; metatarsus, about 24 mm.; hind leg, femur, 17 mm.; tibia, 20·5 mm.; metatarsus, about 30 mm.

Frontal prolongation of the head short, light yellow, the nasus stout, decurved; palpi with the basal segments yellow, the terminal segments brown. Antennae with the first scapal segment nearly as long as the remainder of the organ taken together, yellow; remainder of antennae brownish-yellow. Head orange-yellow. Pronotum yellow; lateral margins and a confluent spot on either side of the narrow yellow median area dark brown. Mesonotal praescutum yellow with three broad black stripes, the median stripe broad but short, becoming obsolete near midlength of the segment; lateral stripes short, attaining the lateral margins of the sclerite in front of the root of the wing, confluent with the median stripe, not attaining the suture; scutal lobes yellow, each with two conspicuous isolated brownish-black spots along the anterior margin in transverse alignment; scutellum yellow, the caudal margin of the median area dark brown; postnotum yellow. Pleura yellow; mesopleura dark brown, sparsely variegated with obscure yellow; propleura black; a large oval brownish-black spot on the lateral sclerites of the postnotum before the root of the halteres. Mesosternum dark brown. Halteres dark brown, the base of the stem yellowish. Legs with the coxae obscure yellow, the outer faces suffused with dark brown; trochanters with the outer faces infuscated; femora black, the bases narrowly and indistinctly paler; tibiae with the extreme base (1·3 mm.) brownish-black, the distal half similar, the intervening space broadly (6·3 mm.) and conspicuously light yellow; tarsi black. Wings dark brown; a conspicuous yellow cross-band just beyond the wing-root, the outer margin at arculus; an oval yellow spot near the middle of the wing in cells R and M, immediately before the origin of Rs; centres of cells M, Cu^1 and the anal

cells paler than their margins. Venation: Rs shorter than R^{2+3}; basal deflection of R^2 perpendicular; R^3 longer than R^{2+3}; petiole of cell M^1 and m subequal. Abdominal tergites testaceous-yellow, the median line and the caudal margins of each segment black, to form an inverted T on each segment, the lateral margins most distinct on tergites two to five; sternites obscure yellow, the caudal margins of the segments narrowly blackened; distal abdominal segments with a slight silvery bloom. Ovipositor very short and blunt as in the genus.

Hab. North Queensland: Kuranda (F. P. Dodd). Type, I. 12177.

HABROMASTIX Skuse, 1890.

HABROMASTIX HERONI sp. nov.

General colouration brownish-yellow; vertex with a conspicuous dark brown mark; praescutum with three broad dark brown stripes, the median one split by a pale line; postnotum darkened posteriorly; femora broadly blackened at tips; wings greyish-brown, variegated with pale yellow; R^{2+3} longer than cell first M^2; basal section of vein M^{3+4} more than twice the second deflection.

♂ Length, 14–14·5 mm.; wing, 16·5–17 mm.; antenna, about 14·5–15 mm.

Rostrum slender, yellowish above, dark brown laterally and beneath; palpi dark brown. Antennae with the scape and basal two segments of the flagellum light brownish-yellow, passing into dark brown. Head with the front narrowly grey pruinose; vertex yellow, more fulvous on the tubercle, paler adjoining the eyes, a conspicuous dark brown median stripe, narrowed in front, broadest behind. Mesonotal praescutum brownish-yellow with three broad dark brown stripes, the median stripe split by a capillary pale line, all the stripes attaining the suture; scutal lobes dark brown, the median area narrowly pale; scutellum with the median sclerite dark brown, the lateral regions pale; postnotum whitish-grey, the posterior half conspicuously dark brown, continued to before the root of the halteres. Pleura light brownish-grey, indistinctly striped longitudinally with darker grey. Halteres light brown, the base of the knob darker brown. Legs with the coxae brownish-yellow, the apical half of the outer faces of the fore and middle coxae darker; trochanters obscure yellow; femora light brownish-yellow, the tips broadly and conspicuously blackened; tibiae brownish-black, only the extreme bases brightened; tarsi brownish-black. Wings with a strong greyish-brown tinge, the costal and subcostal cells more yellowish-brown; stigma darker brown; the wing is conspicuously variegated with pale yellow spots and areas, distributed as follows: a small band beyond the arculus extending across the wing but interrupted behind vein Cu; a second larger V-shaped band extends across the wing, the point of the V near midlength of cell M, this area traversing cell Cu; conspicuous areas before the cord and stigma; beyond the stigma in

cell R^2; in the bases of cells second M^2 and M^4 and near the end of vein Cu, this latter including considerable portions of cells M, Cu^1, and Cu; a small circular spot near the end of vein Cu^2 in cell Cu^1; the dark brown streak enclosed between vein Cu and the weak vein immediately behind it (Cu^2 of Tillyard) is thus crossed only by two pale areas; veins dark brown. Venation: Sc^2 ends between one-third and one-fourth the length of R^{2+3}; R^{2+3} longer than cell first M^2; cell first M^2 widened outwardly, the basal section of M^{3+4} more than twice the second section; cell M^1 very short-petiolate to narrowly sessile. Basal abdominal tergites reddish-brown, beyond the third passing into blackish, the lateral margins of each segment with a conspicuous brownish-yellow triangle, this colouration narrowly and indistinctly continued across the posterior margin; basal sternites obscure yellow, beyond the fifth passing into black.

Hab. New South Wales: Dorrigo (W. Heron). Type, I. 12178.

This handsome species, which is most nearly related to *H. ornatipes* Skuse and *H. terrae-reginae* Alexander, is named in honour of its collector, Mr. W. Heron, who has added several species of crane-flies to the list from New South Wales.

ACRACANTHA Skuse, 1890.

ACRACANTHA TASMANIENSIS sp. nov.

Face clear light yellow, the vertex behind the tubercle light violaceous; a narrow dark brown dash adjoining the inner margin of the eyes; mesonotum shiny-reddish, tinged with violaceous; a brownish-black triangle before the wing-root; femora brownish-yellow, the tips broadly blackened; wing subhyaline, the longitudinal veins beyond the cord bordered with brown; petiole of cell M^1 very short.

♀ Length, 22 mm.; wing, 20 mm.; fore leg, femur, 11·3 mm., tibia, 11·8 mm.; hind leg, femur, 12·8 mm.; tibia, 13·7 mm.; tarsus, 22·8 mm.

Frontal prolongation of the head rather short, light brown; nasus long and slender, provided with conspicuous black bristles; palpi brown. Antennae with fifteen segments (in the female); scape reddish-brown, the flagellum dark brown; first scapal segment elongate; basal six flagellar segments enlarged, the inner face of each a little produced and without bristles; remaining seven flagellar segments elongate-cylindrical, provided with very long, conspicuous verticils on all sides. Front and anterior face of the vertical tubercle clear light yellow; vertex and occiput light violaceous; a narrow dark brown mark on the vertex adjoining the inner margins of the eyes, this sending a capillary point cephalad and slightly proximad on to the vertical tubercle; occiput darkened. Pronotum clear light yellow. Mesonotal praescutum shiny-reddish with a faint violaceous tinge; a

rather broad but ill-defined median stripe, split by a capillary darker median line; scutal lobes reddish, the median area more yellowish; scutellum reddish-brown, the median area yellow; two brown spots at the base of the median sclerite; postnotum shiny reddish-brown, the lateral sclerites paler, especially ventrally, with a circular brown spot before the root of the halteres. Pleura faintly reddish; a broad, light yellow longitudinal stripe extending from the propleura to the base of the abdomen, slightly interrupted near the wing-root; a conspicuous brownish-black triangular area before the root of the halteres; a ventral brownish-violaceous longitudinal stripe extending from the propleura across the fore coxa and dorsal margin of the mesosternum. Halteres light brown, the knobs darker. Legs with the outer faces more or less violaceous; trochanters yellow; femora brownish-yellow, the tips broadly (3 mm.) and abruptly blackened; tibiae brown, the base narrowly yellowish, the apex narrowly blackened; tarsi dark brown. Wings subhyaline, the stigma and costal region brownish-yellow; cells second R^1, R^2, and apex of R^3 yellowish; veins beyond the cord conspicuously seamed with brown; linear brownish streaks in cell R and less distinctly in cell M; anal cells greyish, a clear streak in cell first A, adjoining vein second A; veins dark brown. Venation: Rs longer than R^{2+3}, gently arcuated; R^3 a little longer than Rs; petiole of cell M^1 very short, less than r-m; m-cu present, but short. Abdominal tergites reddish-brown, segments five to eight darker; sternites obscure yellow with a broad blackish median stripe. Ovipositor reddish horn-colour, the tergal valves slender; sternal valves flattened, the tips subacute.

Hab. Tasmania: Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 12179.

ACRACANTHA ABNORMALIS sp. nov.

Antennae twelve-segmented in both sexes; basal six flagellar segments incrassated, the terminal four without long verticils as usual in the genus; mesonotum buffy-yellow, the praescutum with four dark brown stripes; pleura silvery-grey; wings faintly greyish; basal abdominal tergites fulvous, the remaining segments more brownish.

♂ Length, about 11 mm.; wing, 14·5 mm. ♀ Length, about 18-20 mm.; wing, 16-20 mm.

Frontal prolongation of the head brown, dusted with grey; nasus long and slender; palpi dark brown. Antennae twelve-segmented in both sexes; scapal segments brownish-yellow; flagellum dark brown; the six basal flagellar segments subcylindrical, gradually decreasing in length from the first to the fourth, the fifth a little shorter than the third; these basal segments have no verticils on their inner face, those on the outer face appressed; the terminal four segments elongate, the last three especially so; verticils inconspicuous. Head dark brown medially,

narrowly buffy-grey adjoining the inner margins of the eyes; in the female the sides of the vertex and genae are grey; a small, button-like tubercle on the vertex between the antennal bases. Mesonotal praescutum buffy, the margins with a light yellowish pollen; four narrow dark brown stripes, the intermediate pair paler at their anterior ends; scutal lobes dark; scutellum and postnotum dark brown, dusted with grey, the postnotum with a capillary dark brown median line. Pleura light silvery pruinose, slightly darker on the mesepisternum; dorso-pleural membranes dark brown. Halteres brown, the base of the stem yellowish. Legs with the coxae brown, dusted with light grey; trochanters brownish-yellow; femora brownish-yellow, the tips narrowly darkened; tibiae light brown, the tips dark brown; tarsi dark brown. Wings with a faint greyish tinge; cells Sc and the stigma brown, the latter continued into cells Sc^1 and second R^1; a brown seam at the fork of Cu. Venation: R^2 oblique, the terminal section gently arcuated, so that cell second R^1 is widest just beyond the base; r is provided with about a dozen strong macrotrichiae and appears as a continuation of vein R^1, all the other veins excepting C being destitute of macrotrichiae; petiole of cell M^1 shorter than m; basal deflection of M^{1+2} about equal to and parallel with m; m-cu obliterated by the punctiform fusion of Cu^1 and M^{3+4}. Abdominal tergite one greyish-pruinose; remaining segments brown, the second tergite more fulvous. Ninth tergite of the male hypopygium with a deep V-shaped notch, the margins thus formed densely set, provided with stiff black bristles; pleural appendage appearing as a simple subclavate hairy lobe. In the female, the second to fourth tergites are more or less yellowish, the remaining tergites dark; sternites brownish-yellow. Ovipositor reddish horn-colour. In the paratype male from Scottsdale the abdomen is almost uniformly brownish-yellow and only five basal flagellar segments are incrassated; in the female, the sixth to eighth abdominal segments are broadly blackened caudally.

Hab. Tasmania: Devonport, Scottsdale, Huon River, Hobart, King Island (A. M. Lea); Cradle Mountain (H. J. Carter and A. M. Lea). Type, I. 12180.

ISCHNOTOMA Skuse, 1890.

ISCHNOTOMA PRIONOCEROIDES sp. nov.

General colouration dark, grey pruinose; antennae subserrate, in the female sex; wings faintly brownish, sparsely variegated with whitish-subhyaline areas; femora dark brown, the basal third rufous; abdomen blue-black, the segments very narrowly margined caudally with pale.

♀ Length, 17·5–18 mm.; wing, 17·3 mm.

Frontal prolongation of the head dark, the nasus comparatively short; palpi brownish-black. Antennae dark brown, twelve-segmented; basal three flagellar

segments subcylindrical; fourth to eighth narrowed basally, widened distally, the apex of each truncated, giving the flagellum a subserrate appearance; two apical segments more elongate. Head dark blue-black, pruinose. Mesonotum badly discoloured in the type, blue-black, light grey pruinose; the praescutum apparently has darker longitudinal stripes, including a capillary median vitta. Pleura grey, almost whitish immediately before the halteres, provided with conspicuous whitish hairs, longest and most conspicuous on the lateral sclerites of the postnotum. Halteres light brown. Legs with the coxae dark, light grey pruinose; trochanters dark brown; femora dark brown, the basal third, or slightly more, conspicuously rufous; tibiae reddish-brown, the tips darkened; tarsi brownish-black. Wings with a faint brownish tinge, sparsely variegated with whitish subhyaline; cells C and Sc more yellowish; stigma brownish; the whitish areas occupy the basal half of cell R^2; outer half of cell first M^2; most of cells M^1 and second M^2; apices of cells M and M^4, and less distinctly in the bases of cells Cu, M^1, and the anal cells; veins dark brown. Venation: Rs moderately long, a little shorter than R^3; r rather faint, oblique, inserted on R^2 shortly beyond the fork; R^{2+3} a little longer than R^2; petiole of cell M^1 about two-thirds of m; basal deflection of M^{1+2} about equal to m and parallel with it; m-cu punctiform; Cu^2 about one-half longer than the deflection of Cu^1. Abdomen blue-black, pruinose; caudal margins of the segments very narrowly and indistinctly margined with paler, less distinct on segment two, gradually widening to the sixth and seventh segments. Terminal segments of the abdomen narrowed; ovipositor relatively small, the tergal valves long and slender; sternal valves much shorter, compressed, the tips obtusely rounded.

Hab. Tasmania: Summit of Mount Wellington (A. M. Lea). Type, I. 12181.

I. prionoceroides is a very distinct species of the genus. The resemblance to species of the northern genus *Prionocera* Low is surprising.

ISCHNOTOMA RUBROABDOMINALIS sp. nov.

Vertical tubercle small, reddish, less distinctly so in the female; mesonotal praescutum with three grey stripes that are narrowly margined with dark brown, the median stripe split by a capillary dark brown line; legs black, only the bases of the femora brighter; abdomen reddish, the segments greyish-pruinose laterally; segments eight and nine dark brown.

♂ Length, 13·5–15 mm.; wing, 15–16 mm. ♀ Length, 16–18 mm.; wing, 14–16·4 mm.

Frontal prolongation of the head dark brown, pruinose; nasus long and slender; palpi dark brown. Antennae dark brown, the first scapal segment pruinose; in the male the first flagellar segment is elongate-cylindrical, the second

and third shorter, subcylindrical; fourth to ninth short, the inner face produced slightly to give the segments a roughly triangular appearance; terminal (twelfth) segment cylindrical, filiform. In the female, the antennae appear to be only eleven-segmented, the subterminal segments serrated as in the male, but less distinctly so. Head dark, greyish-pruinose, narrowly rufous medially; vertical tubercle reddish, infuscated medially, indistinctly trifid anteriorly; in the female this tubercle is obscure reddish-brown. Mesonotal praescutum with the interspaces buffy-grey; stripes grey, narrowly but conspicuously margined with dark brown, the lateral margins of the median stripe becoming narrowed behind and finally obliterated beyond three-fourths the length of the segment; median stripe split by a capillary dark brown line that ends immediately before the suture; margins of the lateral stripes complete, crossing the suture; scutum light grey, the lobes darker grey, each with a dark brown semicircle that is confluent with the margins of the lateral praescutal stripes; scutellum and postnotum clear light grey with a capillary brown line, the lateral margins of these sclerites a darker grey. Pleura light grey, narrowly darkened dorsally, before the wing-root with a conspicuous triangular tubercle that is dark brown, the apex conspicuously orange. Mesosternum greyish-brown. Halteres light brownish-yellow, the knobs dark brown. Legs with the coxae light grey; trochanters dark brownish-grey; femora black, the bases narrowly fulvous; remainder of the legs black. Wings with a greyish tinge; stigma pale brown; wing-surface sparsely variegated with dusky, these areas including the end of cell R^2; an area near the end of cell M adjoining vein Cu and narrow seams to the veins; outer ends of the anal cells faintly darkened; an indistinct obliterative area before the stigma, crossing cell first M^2 into the base of cell M^4; veins dark brown. Venation: R^{2+3} a little longer than R^2; Rs longer than R^{2+3} but shorter than R^3; petiole of cell M^1 about equal to m; m-cu short but indicated. Abdominal tergite one buffy-grey, infuscated dorso-medially; tergites two to seven bright fulvous, the segments conspicuously margined laterally with light grey; sternites similar but more brownish-fulvous, the basal segments slightly pruinose; segments eight and nine dark brown. Ninth tergite narrowly margined laterally with fulvous. In the female, the bright colour includes the eighth tergite. Male hypopygium having the ninth tergite large, with a broad U-shaped median notch, the lateral angles broadly rounded. Ovipositor with the valves long and slender.

Hab. Tasmania: Waratah (H. J. Carter and A. M. Lea). Type, I. 12182.

MACROMASTIX Osten Sacken, 1886.

MACROMASTIX BREVIPETIOLATA sp. nov.

Nasus powerfully developed; antennae short; head orange-yellow; mesonotum shiny testaceous-brown, the pleura more yellowish; wings strongly suffused with

brown, the costal and subcostal cells and the stigma more yellowish; petiole of cell M^1 very short.

♂ Length, about 11-12 mm.; wing, 14 mm. ♀ Length, about 9 mm.; wing, 12 mm.

Frontal prolongation of the head rather short, obscure yellow, the nasus very long and powerful, tufted with hairs at the apex; palpi dark brown. Antennae apparently thirteen-segmented, short in both sexes; the first scapal segment yellowish; second segment yellowish-brown; flagellum dark brown, the basal three segments oval, gradually decreasing in size, beyond the third the segments of the flagellum are elongate, linear, provided with only sparse, though moderately long verticils (segmentation of the flagellum difficult to determine in dried material). Head bright orange-yellow, clearest on the anterior part of the vertex, more obscure on the occiput. Mesonotum rather shiny testaceous-brown without distinct markings, only the posterior third of the postnotum being a little darker. Pleura testaceous-yellow, shiny. Halteres dark brown (the knobs broken). Legs with the coxae testaceous-yellow; trochanters yellow; remainder of the legs slender but not excessively elongated, pale brown, darkening on the tarsi. Wings with a strong brownish tinge, the costal and subcostal cells and the stigma more yellowish; veins dark brown. Venation: Sc^2 ending just before the fork of Rs; R^{2+3} slightly longer than the long Rs; r rather indistinct, on R^2 more than its own length beyond the base; R^3 about one-half longer than R^{2+3}; petiole of cell M^1 very short, a little less than r; m longer than the outer deflection of M^{3+4}; fusion of M^{3+4} and Cu^1 punctiform; cell Cu^1 twice as long as wide; cell second A narrow. A fringe of rather stiff, bristle-like hairs completely surrounds the wing-margin. Abdominal segments obscure brownish-yellow; seventh and eighth segments dark brown. Hypopygium semi-inverted as in many species of this genus.

Hab. New South Wales: Dorrigo (W. Heron). Type, I. 12183.

TIPULA Linnaeus, 1758.

TIPULA LEPTONEURA sp. nov.

General colouration light brown, the thoracic pleura more yellowish; legs long and slender, claws toothed in the male; wings faintly brownish-grey, the costal and sub-costal cells more yellowish; cell R^2 small, cell second A very narrow; male hypopygium fused into a continuous ring.

♂ Length, 14 mm.; wing, 15·5 mm.

Frontal prolongation of the head yellowish-brown; nasus moderately long, provided with conspicuous black and yellow setae; palpi light brown. Antennae

short, if bent backward extending about to the wing-root; scape and first flagellar segment light brown; flagellar segments indistinctly bicolorous, the basal swelling of each segment black, the remainder of each segment brown; flagellar segments slightly dilated before their tips to appear binodose; verticils long and conspicuous. Head greyish-brown; vertex strongly infuscated; a narrow pale border adjoining the eyes; a capillary brown median vitta; genae pruinose. Mesonotal praescutum and scutum light brown with indistinct stripes; scutellum and postnotum yellowish-testaceous. Pleura brownish-yellow. Halteres dark brown, the base of the stem narrowly yellowish. Legs with the coxae yellowish, very sparsely dusted with grey; trochanters yellow; femora brown, the base paler; tibiae and tarsi brown; legs long and slender, the metatarsi longer that the tibiae; claws toothed in the male. Wings faintly brownish-grey, the costal and subcostal cells and the wing-root more yellowish; stigma brown, completely filling cell Sc^1; obliterative areas of slight extent; veins dark brown. Venation: Rs short, about equal to R^{2+3}; cell R^2 small, its inner end pointed; vein R^3 straight, about one-half longer than Rs; cell first M^2 comparatively small, pentagonal; petiole of cell M^1 longer than m; second anal vein short and straight, cell second A being long and narrow. Wings petiolate. Abdomen yellowish basally, segments four to eight dark brown; hypopygium brownish-yellow. Male hypopygium incrassated, the sclerites fused into a continuous ring. Region of the ninth tergite tumid, the caudal margin produced caudad into two blackened, conspicuous blades that are densely set with black spicules. Pleural region slightly produced, the principal appendage a pale, flattened bifid lobe. Region of the ninth sternite carinate, the median area produced into a small, slender tubercle; dorsal caudal angles of the sternite with long, yellow hair. Eighth sternite unarmed.

Hab. Northern Territory: Bathurst Island, Melville Island (W. D. Dodd). Type, I. 12184.

T. leptoneura is a true member of the genus *Tipula*, and apparently the first to be reported from Australia. It belongs to a group or subgenus that consists of many African species (*T. alphaspis* Speiser, *T. langi* Alex., *T. gaboonensis* Alex., and others), distinguished by the small size of the cell R^2, the toothed claws in the males, and the fused sclerites of the male hypopygium.

On AUSTRALIAN COLEOPTERA.

By ARTHUR M. LEA, F.E.S., Entomologist, S.A. Museum.

PART IV.

Family CHRYSOMELIDAE.

Plate iv and Text fig. 337.

The insects dealt with in this part are mostly fungus-frequenting species. It will be noticed that *Diphyllus* and *Diplocoelus* are referred to the Erotylidae, instead of to the Mycetophagidae, the former family being now considered by many authors to be their true location.

COLASPOIDES CUPREOVIRIDIS sp. nov.

♂ Bright metallic coppery-green, under-surface less conspicuously metallic and tip of abdomen reddish; labrum, legs, antennae and palpi reddish, tips of antennae infuscated.

Head with fairly dense but irregular punctures between eyes, becoming smaller and sparser about base, and more crowded on clypeus; median line well-defined. Antennae rather long and thin, third joint no shorter than fourth. Prothorax about twice as wide as the median length, sides evenly rounded, all angles slightly armed; middle with rather small and not very dense punctures, becoming larger but not much denser on sides. Scutellum impunctate. Elytra rather short; with fairly large punctures, subgeminately arranged in parts, posteriorly confined to distinct striae, larger than elsewhere and transversely confluent behind shoulders. Apical segment of abdomen feebly transversely impressed, but in middle shallowly foveate. Legs rather short and stout; front femora acutely dentate; basal joint of front and middle tarsi dilated, of hind pair as long as the two following combined; hind tibiae longer than the others, gently emarginate on lower-surface beyond middle, and then dilated to apex. Length, 5–5·25 mm.

Hab. Queensland: Cairns district (F. P. Dodd). Type, I. 11998.

A bright-green species like *C. bicarinata*, *elegantula*, and *foveiventris*, but readily distinguished from these by the abdomen and hind tibiae: the latter are distinctly dilated near apex, but less suddenly and strongly than in *foveiventris*, and the abdominal fovea is shallower, with its outline less circular.

RHYPARIDA ALLENI Lea.

Two specimens, from Darwin, differ from the type in being smaller, 4–4·75 mm., prothorax with rather larger punctures, and the elytral ones without a water-logged appearance.

RHYPARIDA MEDIONIGRA Lea.

A specimen, from Cue (Western Australia), has the side of each elytron, but not the extreme margin, flavous throughout.

RHYPARIDA CAERULEIPENNIS Lea.

Three specimens, from Cairns, probably belong to this species, but have the legs mostly black, with a slight metallic gloss; one has the elytra purplish-blue, on the others they are brassy, with a slight greenish gloss. Two, from North-Western Australia, probably also belong to the species, their legs are mostly black; and elytra black with a slight coppery gloss. One, from Darwin, has the upper-surface bronzy with a greenish gloss, and the legs obscurely reddish; another has similar legs, but the elytra coppery-purple.

RHYPARIDA FUNEREA sp. nov.

Black, legs blackish-brown, tarsi, antennae (apical joints infuscated), palpi and labrum paler.

Head shagreened and with small punctures, except on clypeus, where they are denser and larger, median line slight. Eyes large, separated slightly more than the diameter of one. Prothorax about twice as wide as long, front angles armed; punctures dense, sharply defined, and of moderate size, becoming small in middle of apex. Elytra rather short, distinctly wider than prothorax; with rows of large punctures, becoming smaller (but not very small) posteriorly, interstices with minute punctures. Flanks of prosternum distinctly striated throughout. Legs stout; femora edentate; claws bifid. Length, 4·5–5 mm.

Hab. Northern Territory: Darwin and Stapleton (G. F. Hill). Type, I. 11981.

A second specimen differs from the type in having the scutellum, elytra, and under-surface of the same dingy-brown colour as the legs. The type in my table of the genus(1) would be associated with *R. crassipes*, which is a considerably narrower species, with coarser punctures, eyes more distant, head and prothorax shining, etc.; the second specimen would be associated with *R. mayae*, which is a narrower species, with the head but not the prothorax shagreened.

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(1) Lea, Trans. Roy. Soc., S.Aust., 1915, p. 112.

RHYPARIDA BIVITTIPENNIS sp. nov.

Reddish-castaneous, legs (knees infuscated), antennae and palpi paler, elytra with a blackish vitta on each side from base to near apex.

Head convex and with minute punctures, except in front and on the clypeus, where they are fairly large and sharply defined; median line short. Eyes large and widely separated. Prothorax not twice as wide as the median length, front angles armed; punctures small and rather sparse in middle, becoming larger and denser, but somewhat irregular on sides. Elytra with rows of rather large punctures, becoming smaller posteriorly. Flanks of prosternum striated from base to apex, the striae becoming very faint near the margins. Femora stout, all distinctly dentate; claws bifid. Length, 4·5–5 mm.

Hab. Northern Territory: Darwin (G. F. Hill, No. 237; and W. K. Hunt).

Some of the specimens are of a brighter red than others; one is almost flavous, with the vittae reduced to rather small infuscated spots, another has the vittae shorter than usual, with the apex of elytra flavous; each vitta usually occupies about one-third of the base, but about two-thirds posteriorly, on one specimen it extends to the apex itself; parts of the under-surface are sometimes infuscated. The prothorax has some coarse, irregular punctures, but not in oblique rows as in *R. polymorpha*; passing that species in my table, it would be associated with *R. maculicollis* and *R. melvillensis*, from the former it is distinguished by its wider form, sparser and stronger prothoracic punctures and differently coloured elytra, and from the latter by its smaller size, very different colour and finer elytral punctures.

RHYPARIDA SEMIOPACA sp. nov.

Flavous, each elytron with a black lateral vitta.

Head opaque and with scarcely visible punctures, even on the clypeus; median line short. Eyes rather large and widely separated. Prothorax about twice as wide as long, greatest width at basal third, all angles armed; surface opaque and impunctate. Elytra with rows of not very large punctures, becoming very small posteriorly; interstices with scarcely visible punctures. Flanks of prosternum with abbreviated striae near coxae. Femora stout and rather feebly dentate; claws bifid. Length, 4 mm.

Hab. Northern Territory: Darwin (G. F. Hill, No. 209). Type, I. 11983.

Parts of the prosternum are very finely striated, but the striae are not continuous from base to apex; this character, and the opaque, impunctate prothorax, readily distinguish the species from the preceding one, to which, at first glance, it appears to belong. The elytral vittae are rather narrow at the base, but dilate posteriorly till they cover most of the surface; on the two specimens in

the Museum they terminate just before the apex. In my table it would be placed in I, *mm*, with *R. didyma*, which is a much larger and otherwise very different species. *R. mediovittata* has the elytral markings shorter and not touching the sides, and the prothorax bimaculate.

RHYPARIDA NIGRIVENTRIS sp. nov.

Castaneo-flavous, an apical U on elytra, and abdomen black; knees, tips of tibiae, tarsi and apical two-thirds of antennae infuscated.

Head subopaque with scarcely visible punctures, except on clypeus, where there are a few distinct ones; front of clypeus conspicuously notched. Eyes rather large and widely separated. Prothorax subopaque, twice as wide as long, sides evenly rounded, all angles armed; punctures sparse and small. Elytra distinctly wider than prothorax; with rows of not very large punctures, becoming inconspicuous posteriorly. Femora stout and unarmed; claws bifid. Length, 4–4·25 mm.

Hab. Northern Terirtory: Darwin. Type, I. 11984.

The sides of the U are about half the length of the elytra, on one specimen its sides are entire, on another each side is encroached upon by the flavous portion. From some directions parts of the flanks of the prosternum appear to be very feebly striated. In my table the species would be referred to I, and from the two species placed there, *R. trimaculata* and *didyma*, it differs in being much smaller, and very differently coloured.

RHYPARIDA OBLIQUA sp. nov.

Pale castaneo-flavous.

Head without punctures, except for a few minute ones at base and on clypeus; median line faint. Eyes rather large and widely separated. Prothorax at base about twice as wide as the median length, sides obliquely diminishing in width to apex, angles unarmed; impunctate or almost so. Elytra rather short; with rows of punctures of moderate size, becoming much smaller posteriorly. Femora stout, edentate; claws bifid. Length, 4·5–5 mm.

Hab. Northern Territory: Darwin, in January (G. F. Hill). Type, I. 11985.

The prosternum is without striae, even near the coxae; the elytral punctures are not very large, their true sizes may be noted from oblique directions, but owing to "water-logging" on several of the, six, specimens before me they appear to be very large, even near the apex. Even the tips of the antennae are not infuscated. Readily distinguished from the other pale species of the genus by the oblique sides of prothorax, each of these being quite straight from base to apex,

with the angles not projecting outwards; in my table it would be associated with *R. pallidula,* which has the sides of the prothorax rather strongly rounded, and the disc with distinct punctures.

EDUSA SUTURALIS Chp.

Five females, from Kulpara (South Australia), have the elytra (except as to their clothing) entirely black.

EDUSA SERICEA Lea.

A specimen, from Beverley (Western Australia), is of a beautiful golden-red, its elytra in some lights have a purplish gloss, and on each several purplish-blue lines may be seen through the pubescence.

EDUSA MULTICOLOR sp. nov.

♂ Coppery-green, most of elytra golden-red or golden-purple, under-surface bronzy, tibiae, basal joints of palpi and basal half of antennae more or less reddish. Head, sides of prothorax, under-surface and legs with fairly dense, white pubescence, elytra with stouter but sparser clothing.

Head shagreened and with fairly dense punctures; median line shallow at base, fairly deep and triangularly dilated in front. Antennae rather long. Prothorax about twice as wide as long, sides evenly rounded; with fairly dense, subasperate punctures, in places transversely confluent. Scutellum with numerous punctures. Elytra with dense punctures, on basal half mostly transversely confluent. Abdomen with basal segment glabrous and finely striated in middle, fifth almost simple. Femora stout, front pair acutely dentate; basal joint of all tarsi somewhat inflated; hind tibiae dilated at apex, apical slope bisinuate, inner edge straight. Length, 5·5–7 mm.

♀ Differs in being larger and wider, much less of upper-surface green, antennae and legs shorter, abdomen with less of basal segment glabrous, and the fifth simple and less encroached upon by pygidium.

Hab. Victoria: Sea Lake (J. C. Goudie, No. 769). Type, I. 11987.

A beautiful species, in appearance rather close to *E. diversicollis,* but less elongate and hind tibiae of male with the inner edge straight, and scarcely different from that of the female. On the male a fairly large subtriangular space about the scutellum is green, the colour then changes, through various golden shades, till on the sides and apex it becomes a beautiful purple, the sides of the prothorax also have a purplish gloss; the female is mostly golden, on the head the only parts green are the clypeus and labrum, the scutellum and the suture for a short distance behind it are green; more of the elytra is purple than on the

male, but the purple is not so bright. On the elytra the white setae are slightly fasciculate in appearance, but they do not form true fascicles, they are absent from a fairly large subtriangular space about the base. The prothorax is very finely transversely striated, so as to appear shagreened.

EDUSA OBSCURA sp. nov.

Black, in parts with a rather slight metallic gloss; labrum, parts of five basal joints of antennae, parts of palpi, and bases of tibiae more or less reddish. Densely clothed with short, ashen pubescence.

Head with dense but more or less concealed punctures; median line narrow. Prothorax with punctures much as on head; front angles rather acutely armed. Elytra with crowded and rather coarse punctures, posteriorly almost confined to striae, interspaces with rather dense and small punctures. Apical segment of abdomen with a wide, shallow depression in middle. Femora stout, subangulate, but scarcely visibly dentate; basal joint of front tarsi slightly inflated. Length, 7 mm.

Hab. New South Wales: Blue Mountains (Dr. E. W. Ferguson). Type (unique), I. 11988.

The metasternum has a distinct purplish gloss, and parts of the upper-surface are slightly brassy or purplish. The three apical joints of antennae are missing from the type, the second joint is stouter than the third, but scarcely half its length. On each elytron two geminate rows of punctures may be traced from the base to beyond the middle, when they converge to become the striae of the apical slope, although the punctures are dense and rather coarse, especially behind the shoulders, they are nowhere distinctly confluent. The front femora from above appear to be edentate, but from below a feeble tooth may be noticed. The apical segment of the abdomen is irregularly impressed, but as the basal one is strongly convex, the sex of the type is doubtful. In my table would be associated with *E. ursa,* from which it differs in being much larger, differently coloured, prothorax with distinct punctures, and elytral punctures larger and some in geminate rows; it is closer to *E. impressiceps,* but is somewhat larger, only feebly metallic, and legs, except the extreme bases of tibiae, entirely black. It is considerably larger than all the non-metallic species.

EDUSA CAPILLATA sp. nov.

Black with a bronzy gloss, front of head coppery-green, labrum, antennae (upper-surface of basal joint and tips of six apical ones infuscated) and basal joints of palpi more or less flavous, or reddish. Densely clothed with ashen pubescence, mixed with longer and more or less erect hairs.

Head shagreened and without distinct punctures, except on clypeus. Antennae rather long and thin. Prothorax shagreened and with very minute punctures. Elytra with crowded punctures, but fairly large only on basal half. Abdomen glabrous along middle, apical segment shallowly depressed towards each side, and with a rather large, round fovea, in middle. Front femora stout and acutely dentate. Length, 6·25 mm.

Hab. New South Wales: Mittagong (Dr. E. W. Ferguson). Type (unique), I. 11989.

Parts of the under-surface have a greenish or coppery gloss. On the prothorax the pubescence is rather longer and denser on the margins than the disc; on the elytra there are quite distinct lines of pale pubescence, although not sharply defined, about nine on each elytron; the longer hairs are very conspicuous on the elytra from the sides, and are distinct, although much shorter, on the prothorax. The type is probably a male, and, in my table, would be associated with *E. aenea*, but is larger, darker, legs entirely black, elytra with denser clothing, the long hairs longer and more numerous, and scutellum not green.

EDUSA PUNCTIPENNIS sp. nov.

♂ Coppery-bronze; labrum, antennae (except tips of some joints), legs (knees infuscated) and basal joints of palpi more or less reddish. Rather densely clothed with ashen or white pubescence, the elytra, in addition, with long, suberect, darker hairs.

Head and prothorax shagreened and with small punctures. Elytra with dense and rather large punctures, becoming smaller posteriorly and nowhere confluent. Abdomen with a small fovea on fifth segment. Legs stout; front femora slightly dentate; hind tibiae simple. Length, 5–5·25 mm.

♀ Differs in having abdomen more convex, nonfoveate, and antennae and legs somewhat shorter.

Hab. Victoria: Aspendale (Dr. E. W. Ferguson). Type, I. 11972.

The front femora are feebly dentate, but from below the tooth is sufficiently distinct. Regarding the species as belonging to D, of my table, it would be associated with *E. tridens*, to which it is certainly close, and from which it differs in being slightly smaller, the male nowhere green, rather more brassy than bronzy, similar in colour to its own female, and the elytra with coarser punctures and longer clothing. Regarding it as belonging to D D, it might be associated with *E. fraterna*, with which it agrees well in colour, except that the femora are paler, and that the elytral clothing is darker, the elytral punctures are also distinctly coarser, and those of the prothorax much finer, although fairly distinct before abrasion. In colour it is close to some specimens of *E. aenea*, but the

elytra are without defined lines of clothing, and are more coarsely sculptured; structurally it is close to *E. melanoptera*, but is conspicuously metallic, and the elytral clothing is decidedly longer.

GELOPTERA ARMIVENTRIS Lea.

Two females, from Thursday Island, appear to belong to this species; they differ from the male in having somewhat shorter legs, hind tibiae without produced apical spur, and abdomen more convex and simple.

GELOPTERA APICILATA sp. nov.

♂ Piceous-brown with a bronzy gloss, parts of under-surface paler; labrum, legs (knees and claws infuscated), basal third of antennae and palpi flavous.

Head with fairly dense and sharply defined punctures. Eyes rather large and prominent. Prothorax about twice as wide as long, sides almost evenly rounded, angles unarmed; punctures much as on head, but somewhat larger near hind angles than elsewhere. Elytra with dense and fairly coarse punctures, becoming confined to striae posteriorly, interspaces with minute punctures. Abdomen finely transversely strigose and with numerous subasperate punctures; fifth segment with a small, transverse, median fovea. Femora stout and edentate; hind tibiae with apical third dilated and bent outwards; basal joint of front and of middle tarsi dilated. Length, 5 mm.

Hab. North-western Australia: Wyndham (J. Clark from W. Crawshaw). Type, I. 11999.

In size and general appearance very close to *G. tuberculiventris*, but hind tibiae very different, abdomen not tuberculate and sides of prothorax different; it is still closer to *G. rhaebocnema*, but the hind tibiae are shorter and somewhat wider at apex, with the whole of the dilated part bent outwards, and the basal two-thirds distinctly thinner, the fourth segment of the abdomen is slightly smaller (slightly shorter than the second and third combined) and not transversely depressed, the fifth has the lateral depressions less pronounced, and the median fovea more abrupt; the punctures of the upper-surface are also somewhat smaller and sparser. The type has three small, slightly elevated, impunctate spaces on the front of the head, but a second specimen is without such.

GELOPTERA VIRIDIMARGINATA sp. nov.

♂ Black with a coppery or bronzy gloss, margins of prothorax and of elytra, and parts of under-surface dark green; labrum, tip of abdomen, and parts of legs obscurely flavous, or testaceous.

Head with dense, sharply defined punctures. Eyes large and prominent.

Prothorax scarcely twice as wide as the median length, sides evenly rounded, front angles unarmed; with dense and fairly large punctures becoming crowded on sides, interspaces with minute punctures. Scutellum impunctate. Elytra with punctures fairly large throughout and in places transversely confluent, but with an impunctate line on each from base to apex, and remnants of two others. Abdomen with fairly dense, more or less asperate punctures, in places finely strigose; apical segment with a wide median fovea, its middle rather deep. Femora stout, edentate; hind tibiae moderately long, slightly dilated to apex, inner edge straight almost throughout. Length, 7·5–8·5 mm.

♀ Differs in being more robust, prothorax more transverse, abdomen more convex and non-foveate, and legs shorter, with basal joint of front tarsi smaller.

Hab. Western Australia: Kellerberrin (J. Clark from W. Crawshaw). Type, I. 11967.

In my table would be associated with *G. hardcastlei,* from which the male differs in having smaller eyes, prothorax more rounded in middle, and basal segment of abdomen in parts densely and finely striated, and with more numerous punctures. The head of the male has been damaged, and its antennae and palpi are missing; on the female the antennae are of a dingy flavous, with the tips of five joints infuscated; its palpi are entirely flavous; on both specimens there is a short, impunctate, median line, near the base of the pronotum.

GELOPTERA SOROR sp. nov.

♂ Black with a coppery or bronzy or coppery-green gloss; labrum, base of antennae, palpi, tip of abdomen and base of femora more or less obscurely reddish.

Head with crowded and sharply defined punctures, but in places confluent; with a vague median line. Antennae long and thin. Prothorax about once and two-thirds as wide as the median length, sides gently rounded, hind angles only armed; with crowded punctures, slightly larger than on head. Scutellum impunctate. Elytra much wider than prothorax; with crowded punctures, many of which are transversely confluent, but leaving some feebly defined impunctate lines, which posteriorly are marked off by striae. Abdomen faintly transversely striated, and with rather small punctures, apical segment with a wide impression. Femora unarmed; hind tibiae longer than the others, rather thin and curved in middle. Length, 8 mm.

Hab. Western Australia: Beverley (E. F. du Boulay). Type, I. 11968.

In general appearance very close to the preceding species, from which it may be distinguished by the abdominal fovea; on the present species this is fairly deep and extends as an even impression across more than one-third of the segment; on that species it is suddenly deepened in the middle, the deep part being

hardly more than one-fifth the width of the segment; on the present species also the punctures of the upper-surface are more crowded, the legs are darker, and the hind tibiae curved. In my table it would go with *G. hardcastlei*, from which it differs in the basal and apical segments of abdomen, evenly rounded sides of prothorax, smaller eyes and more crowded punctures.

GELOPTERA APICIVENTRIS sp. nov.

♂ Bright, metallic bluish-green, in parts with a faint coppery gloss; labrum, most of antennae, and parts of palpi and of legs more or less reddish.

Head with fairly dense and sharply defined punctures, a vague depression in middle; a small, highly polished, coppery spot near each antenna. Eyes large and rather widely separated. Antennae rather long and thin. Prothorax not twice as wide as the median length, sides almost evenly rounded, hind angles only armed; with rather large, sharply defined punctures somewhat irregular in middle, crowded on sides. Elytra with crowded and rather large punctures, a few transversely confluent before middle, posteriorly near suture confined to striae. Abdomen with basal segment depressed in middle, margins of intercoxal process narrowly elevated, fourth segment large, a wide depression on each side of middle, fifth segment foveate and red in middle, with a distinct central granule. Femora stout, front ones rather minutely dentate; hind tibiae elongate, apical fourth dilated. Length, 5–5·25 mm.

Hab. Northern Territory: Darwin. Type, I. 11970.

In general appearance close to *G. intercoxalis*, but legs darker, front femora dentate, abdomen with the ridge on each side of intercoxal process not passing the coxa, and two apical segments different.

ALITTUS CARINATUS Blackb.

On the type and on several other specimens of this species, the elytra are uniformly coloured, except that on some parts the green sheen is more conspicuous than on others; but on three Darwin specimens there are three conspicuous pale lines on each elytron, the punctures between the first and second lines are in four irregular rows; on three others the pale lines are present, but more feebly defined.

ALITTUS FLAVOLINEATUS sp. nov.

♀ Reddish-castaneous, in parts with a coppery, or bluish, or purplish gloss; antennae, palpi, and three distinct lines on each elytron flavous. Head, prothorax, under-surface and legs with depressed, white pubescence, tips of elytra slightly pubescent.

Head with irregularly distributed punctures, sharply defined only on clypeus. Prothorax twice as wide as long, sides almost evenly rounded, angles slightly armed; with large and irregularly distributed punctures, leaving numerous small, subtubercular, impunctate elevations. Scutellum impunctate. Elytra rather wide, slightly diminishing in width from shoulders; with large, round, deep punctures, irregular about base, more or less lineate in arrangement elsewhere. Legs stout; femora edentate. Length, 8–9 mm.

Hab. North-western Australia: Forrest River (J. Clark from W. Crawshaw). Type, I. 11996.

Readily distinguished from all other described species, except *A. carinatus*, by the striped elytra and from the striped variety of that species by the punctures between the first and second stripes being in two rows only, and individually much larger. The sides of the prothorax at first glance appear to be quite evenly rounded, but on close examination faint indications of teeth may be traced on two, of the three, specimens before me.

TOMYRIS SUBLAETA Lea.

Four specimens, from the Blue Mountains, evidently belong to this species, but differ considerably from the types in colour; one has the head, except for a vivid green strip in front, prothorax, scutellum and elytra, of a beautiful golden-red; the others have the head, except at base, and scutellum green, with a wide median portion of the prothorax and elytra golden-red, or brassy.

TOMYRIS NIGRA sp. nov.

♀ Black, with a slight bronzy gloss, less distinct on the elytra than elsewhere, parts of four basal joints of antennae, basal joints of palpi and knees reddish. Elytra with moderately long and not very dense, suberect, white pubescence; much shorter but denser elsewhere.

Head with crowded, asperate punctures. Antennae with five apical joints stouter than usual. Prothorax with a shallow and irregular but distinct impression across middle; punctures slightly larger than on head. Elytra with large, irregular punctures, larger (especially behind shoulders) at basal third than elsewhere, but becoming rather small about apex. Length, 5·25 mm.

Hab. New South Wales: Blue Mountains (Dr. E. W. Ferguson). Type (unique), I. 11993.

In size and colour much like the female of *T. obscura*, but the punctures are much larger and more sharply defined, the five terminal joints of antennae are wider and the clothing is different; in my table it would go with *T. villosa*, but differs from the female of that species in being considerably larger, black with but a slight metallic gloss, and with much larger elytral punctures.

CLEORINA PURPUREA Lea.

On several specimens of this species the upper-surface is of a more or less brassy-green, or blue.

MEGASCELOIDES ARROWI sp. nov.

♂ Castaneous-brown or piceous-brown, antennae paler but some joints infuscated. Clothed with moderately long, white, depressed pubescence or setae, denser on sides of metasternum than elsewhere.

Head with dense but partially concealed punctures; with a vague median line. Antennae rather long, eleventh joint longer than tenth and acutely pointed. Prothorax not twice as wide as long, sides gently rounded, angles slightly projecting; with small and moderately dense punctures. Elytra slightly wider than widest part of prothorax, parallel-sided to near apex; with dense and rather coarse punctures, in places transversely confluent, towards apex with convex interstices between punctate striae. Apical segment of abdomen flattened in middle, with an oblique impression towards each side. Legs stout and moderately long, basal joint of front tarsi inflated, claws acutely bifid. Length, 7–8·5 mm.

♀ Differs in having somewhat shorter and stouter antennae, prothorax fully twice as wide as long, apical segment of abdomen simple, basal joint of front tarsi smaller, and claws almost simple.

Hab. Western Australia: Cue (H. W. Brown); Northern Territory: Tennants' Creek (J. F. Field). Type, I. 3410.

In general appearance fairly close to *M. squamosus* Baly., but the prothoracic punctures smaller, and elytra without conspicuous erect hairs. In some respects it appears close to the description of *Terillus duboulayi* Baly., but on that species the antennae are said to be "not half the length of the body" and the elytra to be "covered with white and pale fuscous scales, arranged in broad, ill-defined vittae." On six specimens of the present species the clothing is uniformly white and the antennae, even on the female, are more than half the length of the body, the legs are also darker than noted for those of *duboulayi*; from the description of *M. perplexus* Baly., it differs in being considerably larger, eyes not entire, and abdomen and legs considerably darker.

In naming this species after Mr. Gilbert J. Arrow, I would like to place on record my gratitude to him for the invariable courtesy I have received from him, in clearing up the synonymy of species whose types are in the British Museum, in answering enquiries about others, and for the examination of cotypes and other authentic specimens.

MACRAGONUS METALLICUS sp. nov.

Blackish or purplish, with a conspicuous coppery-green gloss; muzzle (tips of mandibles excepted), scutellum, palpi, under-surface, coxae, and femora

(except knees) red; basal joint of antennae metallic green, five following joints shining purple, the others opaque purple.

Head with sparse and small punctures; with a shallow inter-ocular, triangular depression, each angle of which is marked by a small fovea. Prothorax about twice as wide as long; each side with three large teeth: the largest one median, the next apical and about half its size, the other and smallest one basal; a fairly large fovea on each side of middle, in line with antennae; punctures somewhat larger and sparser than on head. Scutellum triangular. Elytra much wider than prothorax; each with three irregular foveae triangularly placed: the largest about two-fifths from the base and one-third from the suture, the smallest not quite half-way between it and the base, the other (a rather ill-defined one) marginal; with rows of rather distantly placed punctures, fairly large at the base, almost disappearing posteriorly. Length, 11·5–12 mm.

Hab. Australia (Blackburn's collection); Queensland: Kuranda (G. E. Bryant). Type, I. 4181.

From some directions the whole upper-surface appears dark metallic-green, from others metallic-purple, except that some of the punctures appear as glittering green spots. On the type some of the under-parts of the tibiae are obscurely reddish. The specimen from Kuranda (returned to Mr. Bryant) has the head red to the base, the extreme base of elytra obscurely diluted with red, the knees not green, and most of the tibiae reddish; the punctures on its head are larger than on the type, its inter-ocular depression is deeper, but its hind angle not foveate, punctures on prothorax larger, less sparse, and somewhat crowded on the largest tooth on each side, the elytral punctures are also larger. I believe the differences to be individual, rather than sexual, and that each is a male.

MACROGONUS MACULATUS sp. nov.

Plate iv, fig. 1.

♂ Metallic purplish-blue; a large spot at base of head, pronotum (except for a large medio-basal spot), prosternum, and parts of mesosternum and of metasternum blood-red; elytra flavous, a short portion of suture, a small space on each side of scutellum, and ten isolated spots purplish-blue; parts of muzzle reddish, five basal joints of antennae shining, the others opaque.

Head with punctures of irregular size and irregularly distributed; a deep median line, from summit of clypeus halfway to base. Prothorax gently and almost evenly convex, not much wider than long, each side with a large and fairly acute tooth in middle, each angle with a smaller tooth, middle of apex conspicuously incurved; punctures sparse and small. Elytra much wider than base of

prothorax; with rather small punctures, more or less seriate in arrangement. Length, 11·5–13·5 mm.

♀ Differs in having the prothorax much smaller, the sides evenly and rather gently rounded in middle, front angles concealed from above, each side of disc with a small fovea, apical incurvature wider and less pronounced, abdomen more convex, and legs and antennae somewhat shorter and thinner.

Hab. Queensland: Cairns district (F. P. Dodd and G. E. Bryant). Type, I. 4773.

Readily distinguished from all other described species of the genus by the spotted elytra, the spots on each are: one on the shoulder, a small one (marking the position of a shallow fovea) on the side near the base, one level with it but near the suture, a central one slightly beyond the middle, and one halfway between it and the apex. The sexual differences of the prothorax are very striking; on the female (returned to Mr. Bryant) the postmedian spot on each elytron is about twice the size of the subapical one, the latter being halfway between the suture and side; on the male the subapical one is larger than the postmedian one, and almost touches the margin.

FAMILY EROTYLIDAE.

EPISCAPHULA DUPLOPUNCTATA Blackb.

E. nigrofasciata, Blackb., var.

E. subapicalis Lea, var.

The type of *E. duplopunctata* appears to be a rather rare form of the species, subsequently named *E. nigrofasciata*. Its prothorax is without larger punctures along the median third, the punctures in the elytral series are slightly larger than usual, the smaller ones on the interstices are more numerous and slightly more conspicuous than usual. Some specimens from Queensland, including a cotype of *E. nigrofasciata*, have identical markings, and of these some have elytral punctures exactly the same, and others have the prothoracic ones similar. It occurs in Northern Territory, Queensland, and New South Wales. A specimen, from Sydney, as small as the type (Queensland specimens are usually slightly larger) has prothoracic punctures exactly the same, but on the elytral interstices the punctures are very minute. The species is also extremely close to some of the forms of *E. australis*, and I am doubtful as to whether it should not be regarded as a form of that species.

The form I named *E. subapicalis* as a variety of *E. termitophila* (*termitophila* itself, however, is distinct by its more dilated middle parts, and elytra with only two series of red markings, instead of three) appears also to belong to the species,

but has the black basal fascia of the elytra continuous, instead of twice interrupted to the base itself; it appears to be the commonest form of the species, and extends from Cairns, in Queensland, to Derby, in North-Western Australia.

var. OBSCURICOLLIS var. nov.

Ten specimens from Queensland (Cooktown, Cairns, Bowen, and Gayndah) and one from New South Wales (Dorrigo) may be considered as representing another variety, having the dark prothoracic blotch ill-defined, and extended so as to cover the whole surface except a narrow space at the apex, or an obscure space in each front angle; each elytron has three reddish transverse spots or fasciae: one subbasal, with a short medio-frontal extension, one postmedian, its concave side towards the apex, the other and smaller one subapical. The punctures on the prothorax and elytra are variable; to the naked eye the prothorax at a glance appears entirely dark.

EPISCAPHULA GUTTATIPENNIS Blackb.

This species is structurally close to *E. duplopunctata,* but is slightly more parallel-sided and with somewhat longer antennae; the type, and a specimen from Townsville, have identical pale elytral markings, which may be regarded as a subbasal fascia broken up into four spots, a postmedian fascia, also broken up into four spots, and a subapical fascia interrupted at the suture; a somewhat larger specimen, from Townsville, has smaller punctures and the postmedian fascia only broken up into two spots.

EPISCAPHULA FOVEICOLLIS Blackb.

On three specimens with the typical markings of this species (a cotype and others from Charters Towers and Normanton), there are large punctures congested into spaces on each side of the prothorax near the base and apex; on the apical spaces the surface is flattened in two specimens, and very feebly depressed on the other. A specimen, from the Stewart River, that appears to belong to the species, has no medio-lateral spots on the prothorax, the medio-basal one is distinctly bifid in front, the larger punctures are more generally distributed, although fairly dense in the angles; on the elytra the subapical spots are conjoined to form a fascia continuous from side to side.

EPISCAPHULA NIGRONOTATA sp. nov.

Plate iv, fig. 2.

Black; prothorax flavous, a large black spot on each side of the middle, the two conjoined at base; elytra flavous, a large black spot about scutellum conjoined

to a larger median spot; a spot on each shoulder, one on each side about the middle, and one about the apical third; the part beyond the latter castaneo-flavous; sides of prosternum and two apical segments of abdomen flavous; parts of legs obscurely diluted with red.

Head with fairly dense and small, but sharply defined, punctures, becoming larger about base. Antennae with third joint fully twice as long as fourth. Prothorax about twice as wide as the median length, sides oblique to near apex, front angles produced and acute; with small and fairly dense punctures, a few of larger size in a shallow depression each side of base. Elytra diminishing in width from near base; with small and fairly sharply defined punctures. Coxal lines of abdomen short but fairly distinct. Length, 8–10 mm.

Hab. Queensland: Cairns district (A. M. Lea). Type, I. 11772.

A beautiful species with colours somewhat as on fresh specimens of *E. pictipennis*, but the pattern is not the same, the width across the middle is greater, the series of punctures on the elytra are smaller, etc. One of the four specimens has a small pale spot on the forehead, on another the three median spots of the elytra are combined to form an irregular fascia; on all of them the tips of the elytra are of a more reddish colour than the other pale parts. The elytral punctures are all really small, but owing to "waterlogging" there appear to be rows of quite large ones on the paler parts, but from the sides their true sizes are evident.

EPISCAPHULA ATROMACULATA sp. nov.

Plate iv, fig 3.

Black; prothorax flavous, a large round black spot on each side of middle; elytra flavous, tips pale castaneous, a large almost square spot about scutellum, a rounded one on suture before middle, and three isolated ones on each elytron: an oblique one commencing on the base near the shoulder and extending to level with middle of round sutural spot, a triangular one with its most acute angle directed to the hind end of the sutural spot, and an irregularly shaped one with an extension almost connecting it with the suture one-fifth from apex; epipleurae black; front and sides of prosternum and two apical segments of abdomen flavous; parts of legs obscurely reddish.

Head with dense, sharply defined punctures of moderate size. Third joint of antennae twice the length of fourth. Prothorax about once and one-half as wide as long, sides oblique to near apex, where the angles are produced and somewhat acute, hind angles slightly rounded off; punctures much as on head, but rather less dense, a few of larger size in a small depression each side of base. Scutellum twice as wide as long. Elytra narrow; with small but sharply defined punctures. Coxal lines of abdomen inconspicuous. Length, 10·25–11 mm.

Hab. Queensland: Kuranda (H. J. Carter from F. P. Dodd); Innisfail (National Museum from C. French). Type, I. 12004.

A very distinct species. There is a small spot on each side of the elytron near the end of the black epipleurae and invisible from above, on the type it is hardly more than a stain, but on the cotype it is larger and more distinct. On the elytra there are rows of small punctures, hardly larger than those on the interstices, but owing to "waterlogging" they appear, from directly above, to be much larger.

THALLIS VINULA Er.

T. subvinula Blackb., var.

Plate iv, fig. 4.

The form described by Blackburn as *T. subvinula* can only be regarded as a slight variety of *T. vinula,* with the elytral markings somewhat smaller than usual. Slight differences in the punctures may be seen on many specimens with markings of normal size. The typical form occurs in New South Wales, Victoria, and South Australia, as well as in Tasmania. Some of the New South Wales specimens in the Museum were taken from *Polyporus salignus.*

The species also occurs in Western Australia, where the typical form is rare and the variety *subvinula* fairly common; of twenty-four specimens from Western Australia hardly two are exactly alike in size (4·5–6·5 mm.), colour and markings; the punctures, as a rule, are decidedly stronger than on specimens from Eastern Australia; the prothorax varies from dingy-brown to deep-black, the elytra are occasionally entirely dark, but usually have four flavous spots: of these the two at the basal third vary considerably in size, and occasionally are conjoined to form an irregular fascia, or they may be so small and obscure as to be traceable with difficulty; the two postmedian ones are seldom large, and are often hardly traceable.

var. OCCIDENTALIS var. nov.

Six specimens have the upper-surface black, except for two flavous spots, of variable size, at the basal third of the elytra.

Hab. Western Australia: Swan River (J. Clark and A. M. Lea).

THALLIS BIFASCIATA Crotch.

A specimen from Sydney (the type was from Rockhampton) agrees with the description of this species.

Var.? A specimen, from Lucindale, possibly also belongs to the species, but differs from the Sydney one in being somewhat smaller and narrower, antennae

somewhat shorter, with the third and fourth joints equal, the black spot about the scutellum is semicircular instead of quadrate, and the red tips of the elytra are much less pronounced.

THALLIS ERICHSONI Crotch.

A specimen from Sydney, the original locality, and three from South Australia, appear to belong to this species; two from the latter State (standing as *T. erichsoni* in the Blackburn collection) have the pronotum entirely black, except that along the middle the derm is obscurely diluted with red, but on the other from South Australia, and on the one from Sydney, the red is more conspicuous, so that the pronotum might be regarded as of a dingy red, with the sides widely infuscated. The elytral markings, however, appear to be constant.

THALLIS FEMORALIS Blackb.

This species varies considerably in size and in the intensity of its markings; it is fairly common in Tasmania, to which State it appears to be confined.

THALLIS JANTHINA Er.

This species occurs in abundance in many kinds of fungi, including *Polyporus salignus*, in New South Wales, Victoria, Tasmania, and South Australia.

THALLIS COMPTA Er.

Hab. Victoria, Tasmania, South Australia.

THALLIS DENTIPES Blackb.

Hab. New South Wales, Victoria, Tasmania, South Australia.

THALLIS VENUSTULA Blackb.

Hab. New South Wales: Forest Reefs, Dorrigo, Clarence River.

THALLIS ALTERNATA sp. nov.

Plate iv, fig. 5.

Black; three fasciae on elytra, metasternum, abdomen, and tarsi reddish, some other parts of legs and palpi obscurely reddish. Densely clothed with dark pubescence, becoming pale on the pale parts; in addition with numerous, suberect hairs.

Head with dense and (where not concealed by pubescence) sharply defined punctures. Antennae rather short, third joint slightly longer than fourth. Prothorax almost twice as wide as long, sides slightly uneven; punctures much as on head. Elytra no wider than widest part of prothorax, parallel-sided to near

apex; with regular rows of fairly large punctures, the interstices with numerous small ones. Prosternum with rather coarse punctures on sides, smaller ones in middle; intercoxal process small. Coxal lines of abdomen inconspicuous. Length, 4–5 mm.

Hab. New South Wales: Ropes Creek (Dr. E. W. Ferguson), Sydney (Blackburn's collection), Windsor (A. M. Lea), Dorrigo (W. Heron); Northern Territory: Daly River (H. Wesselman), Melville Island (G. F. Hill, No. 3461). Type, I. 12008.

Allied to *E. erichsoni* and *E. australiae,* but with very different elytral markings; these, from directly above, appear to be in alternating red and black bands; of the red ones the first occupies the basal two-fifths, except for a large spot (varying from semicircular to transversely oblong) about the scutellum, and a narrow space (invisible from above) on each side, it usually has a short extension on the suture; the second is median, somewhat oblique, rather narrow, and extends neither to suture nor sides; the third is at the apical fourth, slightly longer than the second, is usually, but not always, interrupted at the suture, and terminates before the sides; the scutellum is usually obscurely diluted with red. The Daly River specimen has the middle of the apex of prothorax obscurely reddish, and the red still more obscurely traceable along the middle to base.

THALLIS SUBTUBERCULATA sp. nov.

Plate iv, fig. 6.

Black; sides of prothorax, elytra (four black spots excepted), most of abdomen, tarsi, middle coxae and palpi more or less red. Moderately densely clothed with rusty-red pubescence.

Head with sharply defined punctures of moderate size. Antennae with third joint about once and one-half the length of fourth, joints of the club not twice the width of the others. Prothorax about twice as wide as its shortest length, sides obtusely serrated, apex truncated in middle and notched near each side, the commencement of each notch marked by a slight tubercular swelling; punctures more irregular than on head, and leaving a shining median line. Elytra parallel-sided to near apex; with regular rows of fairly large punctures, becoming smaller posteriorly, the interstices each with a row of small ones. Intercoxal process of prosternum rather wide, posterior end obtuse. Coxal lines of abdomen traceable to beyond middle of first segment. Length, 5·5–6·5 mm.

Hab. Victoria: Warburton (H. J. Carter and J. A. Kershaw), Warragul (J. C. Goudie). Type, I. 12007.

A hairy species allied to *T. insueta, T. erichsoni, T. australiae,* and *T. alternata,* but elytra with four black spots, and the prothorax with a feeble tubercle

on each side of middle of apex; the spots on the elytra consist of a semicircular to transversely-oblong one about the scutellum, a small one on the suture near apex, and a larger, rounded, completely isolated one, on the middle of each elytron; on two of the specimens the black portion of the pronotum is entire, but on two others the middle of its apical half is red.

THALLIS HOPLOSTETHA sp. nov.

Plate iv, fig. 7.

♂ Black, two elytral vittae, abdomen, legs, antennae and palpi more or less flavous, rest of under-surface more or less obscurely diluted with red. Rather densely clothed with pale, rusty pubescence.

Head strongly convex and with a stridulating file on forehead; with fairly dense but irregular punctures elsewhere. Antennae with third joint slightly larger than the adjacent ones; club rather small. Prothorax scarcely one-fourth wider than median length, apex widely produced and overhanging head, notched near each side, sides gently and evenly rounded, a narrowly impressed line almost on each margin; with dense punctures, but leaving a shining median line on basal half; produced portion of apex densely granulate. Elytra scarcely wider than prothorax, parallel-sided to near apex; punctate-striate, striae distinct throughout, interstices with rather coarse punctures, becoming smaller and denser posteriorly. Prosternum with a large hairy cavity in middle of apex, an acute process overhanging the cavity; intercoxal process not very wide, its hind end obtuse. Abdomen with coxal lines distinct to near apex of basal segment. Femora stout, grooved along under-surface, the ridge on each side of the groove finely serrated; tibiae widely dilated to apex. Length, 8–9 mm.

♀ Differs in having the head smaller, forehead not separately convex, without a stridulating file, prothorax shorter, the apex less overhanging the head, with asperate punctures instead of granules, the prosternum unarmed, and without a medial-apical cavity.

Hab. New South Wales: Galston (D. Dumbrell), Sydney (A. M. Lea). Type, I. 12010.

The conspicuously armed prosternum, stridulating file on head, and longitudinal markings of elytra readily distinguish this species from all other named Australian Erotylidae. In the female the prosternum is unarmed, and its hind parts are exactly as in *T. insueta.* The file consists of about fifteen transverse ridges, becoming smaller in front; they are often almost or quite concealed by the overlapping prothorax. On several specimens, especially females, the darker parts are more or less chocolate-brown; each elytral vitta commences on the shoulder, is rather suddenly inflated inwards so as to occupy about six interstices,

and is then narrowed to occupy about two or three to near the apex, which it does not reach.

THALLIS FERRUGINEA sp. nov.

Ferruginous, legs of a somewhat brighter colour. Densely clothed with short, rusty or ashen pubescence, mixed with longer hairs.

Head with crowded punctures partially concealed by clothing. Antennae short, third joint slightly longer than the adjacent ones; club rather small. Prothorax as long as wide, apex truncated almost throughout, each marginal line invisible from above except at ends; punctures as on head. Elytra slightly more than twice the length of prothorax and scarcely wider, sides feebly rounded; with regular rows of punctures, in shallow striae, interstices with dense and small punctures. Prosternum with intercoxal process rather narrow. Abdomen with coxal lines distinct to about one-third from apex of basal segment. Legs rather short and stout; middle and hind tibiae denticulate on lower-surface. Length, 5 mm.

Hab. Western Australia: Cue (H. W. Brown). Type, I. 11776.

A dingy species, nearer *T. basipennis* than any other named one of the genus, but considerably narrower, with different elytral clothing.

THALLIS SERRATIPES sp. nov.

Of a dingy reddish-brown or castaneous; most of head black, elytra flavous, with black markings.

Head with numerous, but not crowded, sharply defined punctures. Antennae moderately long, third joint about one-fourth longer than the adjacent ones, ninth and tenth each twice as wide as long, eleventh longer than wide. Apical joint of each palpus subconical. Prothorax about once and one-half as wide as long, apex truncated across middle and obtusely notched near each side, sides feebly rounded, lateral and basal gutters distinct; punctures much as on head. Elytra distinctly wider than prothorax, parallel-sided to near apex; with regular rows of rather large punctures, in shallow striae, interstices almost or quite impunctate. Middle portion of prosternum with dense and more or less confluent punctures, the sides with sparse and larger ones; intercoxal process narrow, obtusely rounded posteriorly. Coxal lines of abdomen scarcely traceable beyond coxae. Legs long; front femora narrowly ridged on under-surface, the ridge finely serrated and terminating in a sharp but rather small tooth. Length, 6·25–8 mm.

Hab. New South Wales: Macquarie Pass, on *Polyporus salignus* (Dr. J. B. Cleland); Victoria: Alps (National Museum from C. French). Type, I. 11775.

An elongate species, with longer antennae and legs than usual. The upper

surface is glabrous, except for scarcely visible remnants of pubescence on the apical sides of elytra. On several specimens the antennae are almost black, and several have the sides of prothorax paler than the disc. On the elytra the black markings consist of a large blotch about the scutellum, a spot on each shoulder, a wide median irregular fascia (usually narrowly interrupted at the suture), and the apical third, the anterior portion of the latter appearing as three triangles, of which the sutural one is the widest; on several specimens parts of the dark markings are obscurely diluted with red; on one they are all connected: the median fascia, for the width of two interstices on each side of the suture, with the basal blotch, and narrowly on each side of, but not actually on, the suture with the apical marking; and also narrowly on the margins with the humeral spots; on most specimens, however, all the flavous parts of the elytra are more or less narrowly connected. Owing to "waterlogging" the seriate punctures on the pale parts of the elytra, from directly above, appear to be much larger than they really are, but when viewed obliquely they are seen to be no larger than the adjacent ones on the dark parts.

THALLIS METASTERNALIS sp. nov.

Plate iv, fig. 8.

Dull reddish-brown; most of head and part of antennae blackish; prothorax blackish, an obscure reddish vitta on each side; elytra black, with flavous-red markings; a fascia at basal third, narrowly connected along middle of each elytron with the base, so as to isolate a large blotch about the scutellum, an irregular post-median fascia, not quite touching suture or sides, and a large spot on each side of apex. Upper-surface with extremely short and sparse (scarcely visible) pubescence.

Head with sharply defined and numerous but not crowded punctures. Antennae with third joint slightly longer than adjacent ones, ninth and tenth each almost twice as wide as long, eleventh slightly longer than wide. Apical joint of each palpus subconical. Prothorax near apex almost twice as wide as the median length, an obtuse notch near each side of apex, sides decreasing in width from near apex to base, and very feebly irregular, lateral and basal gutters well defined; punctures slightly larger than on head. Elytra parallel-sided to near apex; with regular rows of fairly large punctures, becoming smaller posteriorly; interstices with sparse and minute punctures. Intercoxal process of prosternum not very wide, obtusely pointed at end. Metasternum with large and sparse punctures on sides. Abdomen with coxal lines traceable to apex of basal segment. Front femora feebly ridged along under-surface, the ridge terminating in a feeble tooth. Length, 5 mm.

Hab. New South Wales: Sydney (Dr. E. W. Ferguson). Type (unique), I. 12005.

About the size of *T. macleayi*, and with somewhat similar markings, except that each shoulder is black, but the lateral gutters of the prothorax are much nearer the margins. The pubescence is almost invisible from above, and even from the sides could be easily overlooked.

THALLIS TRICOLOR sp. nov.

Plate iv, fig. 9.

Black; an orange-yellow spot on forehead, prothorax orange-yellow, a large subovate spot on each side of middle, touching the base at its narrower end; elytra flavous with black markings, the tips orange-yellow; prosternum (except for some infuscations about coxae) and two apical segments orange-yellow, the three basal segments more or less infuscated or black. Upper-surface glabrous.

Head with not very dense and rather small but sharply defined punctures, becoming dense on clypeus. Antennae with third joint about once and one-half the length of the adjacent ones, ninth and tenth each at apex twice as wide as the median length, eleventh about as long as wide. Apical joint of each palpus subconical. Prothorax not twice as wide as long, widest close to apex, obtusely notched on each side of apex, lateral striae extremely close to margins; punctures small and not very dense, but mostly sharply defined. Elytra distinctly wider than prothorax, parallel-sided to near apex; with regular rows of punctures of moderate size, becoming small posteriorly; interstices with scarcely visible punctures. Prosternum in parts impunctate; intercoxal process rather narrow, produced to an obtuse point posteriorly. Coxal lines of abdomen not distinct beyond middle of the basal segment. Front femora ridged on under-surface and dentate in male, simple in female. Length, 6–7 mm.

Hab. New South Wales: Dorrigo (H. J. Carter, W. Heron, and R. J. Tillyard). Type, I. 11773.

An elongate, beautiful species, with the three colours of *Episcaphula pictipennis* and *E. nigronotata*, but with the palpi and prosternum of a *Thallis*. On several specimens the legs (except for the claws), antennae, and scutellum are entirely deep black, but on others they are more or less reddish in parts; the black parts of the elytra are the margins and epipleurae (except about apex), a large spot about scutellum, and a spot on each shoulder, a submedian fascia (usually narrowly interrupted at the suture), and three spots (sometimes connected) at the apical third; of these the median spot is larger than the others, and has a fairly wide sutural extension almost to the apex. On several specimens parts of the head are obliquely strigose, or with punctures exhibiting a tendency to become confluent.

HOPLEPISCAPHA gen. nov.

Head subtriangular. Eyes small, lateral, coarsely faceted. Palpi short, apical joint conical. Antennae elongate, three apical joints forming a loose club. Prothorax rather long, sides and base finely margined. Scutellum widely transverse. Elytra elongate, parallel-sided to near apex. Prosternum evenly convex in front, process rather wide between coxae and dilated at its end; coxal cavities closed. Metasternum elongate, episterna narrow, epimera almost entirely concealed. Legs long; front femora of male dentate; tarsi linear, three basal joints setose, fourth appearing as a small basal portion of claw joint, this almost as long as the rest combined.

The elongate antennae, with club loosely articulated and hardly more than continuous with the preceding joints, is at variance with all other described Australian Erotylidae, and with all those figured by Kuhnt (2); but the tarsi are much as figured for *Coptengis sheppardi*.(3) When the abdomen has been wetted the coxal lines are faintly traceable almost to the apex of the basal segment, but they disappear when dry. For the present the genus may be referred to the vicinity of *Episcaphula*.

HOPLEPISCAPHA LONGICORNIS sp. nov.

Fig. 337.

♂ Castaneo-flavous, legs flavous, knees somewhat infuscated; basal half of head, a large spot on each side of prothorax, and most of elytra, black or blackish. Upper-surface glabrous, parts of under-surface sparsely clothed.

Head with dense and sharply defined, but not very large punctures, a shallow depression at each side of clypeal suture. Antennae passing middle coxae, first joint stout, third almost twice as long as second, and about one-third longer than fourth, the others to eighth gradually decreasing in length, ninth and tenth slightly wider than eighth, and each shorter than eleventh. Prothorax slightly longer than wide, each side of apex obtusely notched behind the eye, base and sides narrowly margined; punctures much as on head, except that they are not quite as dense. Scutellum with distinct punctures. Elytra no wider than widest part of prothorax; with rows of rather large punctures, becoming smaller posteriorly; interstices with sparse and small punctures. Prosternum with dense and rather small punctures. more or less transversely confluent, the flanks with larger, round, non-confluent ones. Metasternum and abdomen with small punctures, becoming larger on sides. Front femora ridged along middle, the ridge

(2) Kuhnt, in Wytsman's Genera Insectorum, Fasc. 88.

(3) *L.c.*, pl. iv, fig. 7c.

ending in a strong tooth; front tibiae more strongly arched at base, and stouter at apex than the others. Length, 6–6·5 mm.

♀ Differs in the head being smaller, with shorter antennae, prothorax shorter, somewhat transverse, and slightly narrower than elytra, front legs with unarmed femora and tibiae thinner.

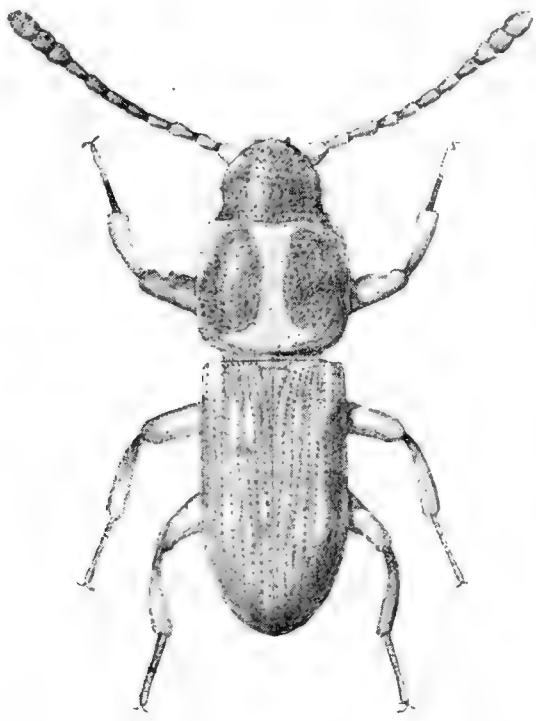

Fig. 337. *Hoplepiscapha longicornis*. Lea.

Hab. Western Australia: Geraldton (J. Clark), Mount Barker (A. M. Lea). Type, I. 12014.

The spot on each side of the prothorax is elliptic in shape and extends almost the length of the segment; the pale parts of the elytra are the base and apex narrowly; suture, shoulders, a series of from four to eight narrow spots at the basal fourth, the lateral ones sometimes connected with the humeral ones, and another series, of from six to twelve, beyond the middle. On one male the dark parts of the elytra are hardly more than castaneous, and the dark parts of the prothorax and head not much darker.

TRITOMA AUSTRALIAE sp. nov.

Blackish or blackish-brown, elytra coppery or coppery-green, or blue; head, palpi, six basal joints of antennae, prosternum, abdomen and legs flavous, or castaneo-flavous, apical and lateral margins of prothorax and sides of metasternum more or less obscurely diluted with red. Under-surface and legs finely pubescent, upper-surface glabrous.

Head wide and almost flat; with fairly dense and sharply defined, but rather small punctures, becoming sparser towards base. Eyes lateral and rather small. Antennae scarcely passing base of prothorax, third joint about as long as first and second combined, or fourth to sixth combined, ninth and tenth each about twice as wide as long, apex incurved to middle, eleventh slightly longer than tenth, its apex rounded. Prothorax at base about thrice as wide as the median length, base bisinuate, much wider than apex, front angles produced and acute, hind ones rectangular, sides narrowly margined; punctures small and rather sparse. Scutellum wide, almost impunctate. Elytra closely applied to and with outlines continuous with those of prothorax, widest at about basal fourth; with regular rows of rather small but sharply defined punctures; interstices wide, not separately convex, with minute and sparse punctures. Intercoxal process of prosternum subconical in front, wide and almost truncate at base. Abdomen with coxal lines distinct and almost enclosing a plate on each side. Legs rather short and stout; femora feebly grooved along under-surface. Length, 3·25–5 mm.

Hab. Northern Queensland (Blackburn's collection), Cooktown (H. J. Carter from H. W. Cox), Babinda (Dr. J. F. Illingworth), Kuranda (F. P. Dodd). Type, I. 11786.

Judged by colour alone the antennae would appear to have a five-jointed club, as the five apical joints are black, but the seventh is much the same shape as the sixth, although a trifle wider, the eighth is much smaller than the ninth, but as it is much wider than long, with its outer angles triangular, it might fairly be regarded as belonging to the club, and the latter in consequence to be four-jointed. Chapuis notes the club of *Tritoma* as three-jointed, and in English specimens of *T. bipustulata* it is conspicuously so, but as, in most details, including the finely faceted eyes, the present species agrees with the characters of that genus, it has been referred to it. It is a briefly elliptic, moderately convex species, and of six specimens no two have the elytra of the same shade of colour, although metallic in all; the specimen, from the Blackburn collection, is slightly narrower than the others, its pronotum is entirely dark, but with a slight greenish gloss, the elytra are purple, and the legs (except the tarsi, knees and trochanters) are blackish.

EUXESTUS TASMANIAE Lea (formerly TRITOMIDEA).

Numerous specimens from Victoria (Dividing Range and Mount Hotham), and New South Wales (Glen Innes), appear to belong to this species, but differ from the types in being slightly smaller and with the head and prothorax almost entirely black or blackish.

Mr. Arrow has stated that *Tritomidea* is a synonym of *Euxestus*.(4)

(4) Arrow, Ann. Mag. Nat. Hist., November, 1917.

EUXESTUS MEDIONIGER sp. nov.

Black; head, a fascia at base of elytra, their apical third and under-surface more or less castaneous; elytral epipleurae, legs, antennae, and palpi paler.

Head with minute punctures, a small fovea on each side of clypeus. Antennae short, basal joint large; club slightly wider than long. Prothorax at base almost thrice as wide as the median length, apex almost truncate, sides very finely margined; punctures sparse and inconspicuous. Elytra with outlines continuous with those of prothorax, widest at about basal fourth; punctures fairly distinct near base, sparse and inconspicuous elsewhere. Abdomen with coxal lines enclosing a distinct plate on each side. Length, 2·25 mm.

Hab. New South Wales: Dorrigo (W. Heron); Western Australia: Manjemup (Dr. E. W. Ferguson). Type, I. 11783.

This species, of which there are five specimens under examination, appears almost to connect the described variety of *E. ventralis* with *T. bivulneratus*; from the former it is distinguished by the more conspicuous markings at base of elytra, much finer punctures and almost truncated apex of prothorax, and from the latter by its somewhat narrower and less convex form, basal markings somewhat larger, not blood-red, and almost touching the suture, and apex of elytra conspicuously reddish.

DIPHYLLUS OBSCURONOTATUS sp. nov.

Black, elytra with two feebly defined spots before the middle; legs, antennae and palpi obscurely reddish. Densely clothed with short, suberect pubescence.

Head with small and dense but sharply defined punctures. Antennae just passing base of prothorax; club two-jointed. Prothorax more than thrice as wide as long, a deep stria near each side, and a much less distinct one near it. Elytra with regular rows of rather large punctures, becoming smaller posteriorly; interstices without distinct punctures. Length, 2 mm.

Hab. Queensland: Cairns district (A. M. Lea). Type (unique), I. 11789.

Structurally close to *D. flavonotatus*, but elytral markings consisting of two vague spots that could be easily overlooked, each is narrow and extends across three interstices; it is shorter and darker than the British *D. lunatus*, but with markings approaching those of that species.

DIPLOCOELUS PILINOTATUS sp. nov.

Black, legs, antennae and palpi obscurely reddish. Densely clothed with golden-grey pubescence, in places blackish; in addition with lines of short setae.

Head with dense, partially concealed punctures. Antennae short; club three-jointed, apical joint slightly longer and distinctly paler than the preceding

ones. Prothorax about twice as wide as the median length, sides gently rounded, front angles feebly produced; striae not sharply defined; punctures much as on head, but more distinct on sides. Elytral parallel-sided to near apex; with regular rows of distinct punctures, becoming smaller towards suture; interstices with minute punctures. Length, 2·25 mm.

Hab. Queensland: Cairns district (A. M. Lea). Type (unique), I. 11790.

On the elytra there appear to be three series of black markings, owing to the pubescence there being similar to the derm on which it rests: a spot on each shoulder, a median fascia, and a subapical interrupted one; on the prothorax there are also obscure markings; but it is probable that on rubbed specimens the markings would disappear or become inconspicuous. Seen from the front, the prothorax appears to have ten longitudinal lines of pubescence, but these decrease in number when viewed from behind.

DIPLOCOELUS DECEMLINEATUS sp. nov.

Dull reddish-brown or castaneous, legs, antennae and palpi somewhat paler. Rather densely clothed with depressed, greyish pubescence, denser and paler on under-surface than on upper; the latter, in addition, with fairly dense, suberect setae

Head with dense, partially concealed punctures. Antennae short; club three-jointed. Prothorax almost thrice as wide as long, sides gently rounded, front angles scarcely produced; with ten slight longitudinal elevations, alternating with slight depressions; punctures much as on head. Elytra at base the width of prothorax, slightly wider to about the middle, with rows of moderately large punctures, interstices with rather dense and small ones. Length, 3–3·5 mm.

Hab. South Australia: Lucindale (B. A. Feuerheerdt), Port Lincoln (A. M. Lea); Tasmania: Ulverstone, Hobart (A. M. Lea). Type, I. 12016.

Excluding the margins, the prothorax appears to have ten slightly elevated lines, marking off depressions, including a fairly distinct median one, the depressions on each side of the latter interrupted in the middle.

DIPLOCOELUS PLATYSOMUS sp. nov.

Blackish or blackish-brown, elytra somewhat paler but very obscure, legs, antennae and palpi castaneous. Moderately clothed with short, depressed, pale pubescence.

Head wide; with dense and small but rather sharply defined punctures; a shallow depression towards each side of clypeal suture. Eyes small, lateral, coarsely faceted. Antennae short, club two-jointed. Prothorax not twice as wide as long, widest and straight at apex, hind angles rounded off; with small and

fairly dense punctures, becoming crowded on sides. Elytra parallel-sided to near apex; with rows of fairly large punctures, becoming smaller towards suture and posteriorly; interstices with small punctures. Length, 2 mm.

Hab. Lord Howe Island (A. M. Lea). Type, I. 12023.

The impressed lines towards each side of the prothorax that, in addition to the marginal ones, are so conspicuous on most species of *Diplocoelus*, are represented on the present species by a submarginal one that can be seen, from certain directions, near the apex only; the transverse line near the base of the head that (when not concealed by the prothorax) is also usually very distinct, is represented by a shallow indistinct one; nevertheless the species appears to be a true *Diplocoelus*, and to be allied to *D. angustulus* and *D. apicicollis*, but it is shorter, much wider, flatter, and darker, with smaller punctures, etc. Of seven specimens obtained on the island only one has the prothorax no darker than the elytra.

FAMILY ENDOMYCHIDAE.

STENOTARSUS QUINARIUS sp. nov.

Reddish-flavous, an irregular mark on prothorax, scutellum, four spots on elytra and antennae (basal joints excepted) black. Rather densely clothed with pale, semiupright hair.

Head with minute punctures. Antennae rather short, club stout. Prothorax widely transverse, sides rather strongly rounded, apex much narrower than base and semicircularly emarginate, sublateral striae deep, dilated at base; punctures small but rather sharply defined. Elytra with sides gently rounded; with regular series of fairly large punctures, becoming smaller posteriorly; interstices with small punctures. Length, 4 mm.

Hab. Queensland: Mount Tambourine (A. M. Lea). Type (unique), I. 11796.

Structurally close to *S. arithmeticus* and *S. quinquenotatus*, but with very different markings; the four spots on the elytra are larger than on the latter species, the outer ones are much in the same positions, but the inner ones are much nearer the base; on the prothorax the black mark covers about the basal third, and has a subtriangular extension almost to the apex.

STENOTARSUS BIMACULIPENNIS sp. nov.

Red, three marks on prothorax, two on elytra, scutellum and part of antennae black, coxae and adjacent parts more or less infuscated. Rather densely clothed with pale, semiupright hair.

Head with minute punctures; with two small but distinct impressions between eyes. Prothorax with sides strongly rounded, apex much narrower than base and

semicircularly emarginate, sublateral striae deep, becoming foveate at base; sides with distinct punctures, elsewhere impunctate. Elytra gently rounded, widest at about basal third; with rows of rather large punctures, becoming smaller towards suture and posteriorly, interstices with small but distinct punctures. Length, 3 mm.

Hab. Queensland: Mount Tambourine (A. M. Lea). Type (unique), I. 11795.

Structurally close to *S. quinquenotatus*, but slightly narrower and more convex, prothorax more narrowed in front and elytra behind, legs red and elytra bimaculate. The markings on the prothorax are conjoined at base, and consist of a large equilateral triangle, and a much smaller mark on each side, about half of the surface being dark; the mark on each elytron is of irregular shape, wider than long, and extends across about five interstices at the basal third, and distant about two from the suture, four or five of the apical joints of each antenna are blackish, but the apical half of the eleventh joint is somewhat reddish.

STENOTARSUS PALLIDIPENNIS sp. nov.

Black; elytra, metasternum and abdomen flavous, scutellum and tarsi somewhat darker. Rather densely clothed with pale, semierect pubescence.

Head with numerous small punctures. Antennae rather long; club stout. Prothorax with front angles rounded and somewhat produced, sides elsewhere parallel, sublateral striae deep, becoming foveate at base; punctures sparse and small, but becoming more distinct in lateral gutters. Elytra long, almost parallel-sided to near apex; with rows of punctures of moderate size, becoming smaller towards suture and posteriorly, interstices with minute punctures. Length, 2·75 mm.

Hab. Queensland: Cairns district (A. M. Lea). Type (unique), I. 11801.

Structurally close to *S. parallelus*; but prothorax entirely black and elytra entirely pale.

DAULIS CIMICOIDES Er.

In the diagnosis of *Daulis* the legs were noted as "basi vix distantes" and abdomen as composed of "segmentis 6"; these parts not being again referred to under the species.

Several specimens before me, from Tasmania and New South Wales, probably belong to the species; their hind coxae are widely separated at the base, but the middle ones are much closer together and the front ones almost touch; the abdomen at first appears to be composed of five segments only, but on one specimen a minute sixth one (apparently retractile) may be seen. The elytra

have numerous small shining spots, that, from some directions, appear to be in rows, and there are some scattered, irregular, infuscated spots.

DAULOTYPUS gen. nov.

Head moderately large. Eyes large, lateral, and coarsely faceted. Antennae elongate, eleven-jointed, the three apical joints forming a club. Palpi rather long, apical joint of maxillary pair subconical, of labial pair securiform. Prothorax widely transverse, a short deep groove near each side on basal half. Elytra much wider than prothorax. Legs rather long; hind coxae moderately separated, middle pair rather close together, front pair separated by a narrow keel and with their cavities widely open posteriorly; femora unarmed; two basal joints of tarsi rather wide, the second bilobed, third minute and scarcely distinguishable from base of the claw joint. Wings present.

Close to *Daulis,* but palpi longer and apical joint of labial pair of different shape; the prosternum is also acutely keeled between the coxae. On specimens, which are probably males, the abdomen appears to be composed of six segments, of these the first is not much longer than the second, the second-fourth are subequal in length, the fifth is fairly long at the sides but strongly incurved to middle, the sixth is traceable at the sides but not at the middle; beyond it there is a process that may be an extrusible segment. On the presumed females the basal segment is larger, the fifth is rounded in the middle of the apex, and the sixth (unless it is an extrusible process) is rounded at the end and depressed in the middle.

DAULOTYPUS PICTICORNIS sp. nov.

♂ Reddish-flavous, prothorax and parts of head, antennae and legs black or infuscated. Moderately clothed with short, subdepressed, pale pubescence; in addition with numerous erect setae, or short hairs.

Head somewhat irregularly impressed and with irregularly distributed punctures. Clypeus rather large, on a lower plane than interocular space. Labrum large, wider than clypeus, apex bilobed; with dense punctures. Antennae thin, passing metasternum, first joint rather long, third slightly longer than fourth, distinctly longer than second and slightly shorter than first, ninth and tenth slightly longer than the preceding ones and dilated to their tips, eleventh slightly longer than tenth and somewhat pointed. Prothorax about twice as wide as long, sides narrowly margined, widest near apex, then rounded to apex, incurved towards and then parallel to base; a deep, slightly oblique impression commencing near each hind angle and terminating (but shallower) near apex, obliquely traversed by a shallower impression; a narrow deep impression at base; punctures

dense but not very large on sides, smaller and sparser in middle. Scutellum briefly triangular, almost impunctate. Elytra much wider than prothorax at base, widest about middle, shoulders strongly rounded, sides rather widely margined except at base and apex; with close-set but somewhat irregular rows of rather long punctures, becoming crowded and smaller posteriorly. Under-surface with irregularly distributed punctures. Femora rather stout, hind ones not passing fourth abdominal segment; tibiae rather long, hind pair incurved and dilated at middle. Length, 5–5·5 mm.

♀ Differs in being somewhat wider and more convex, prothorax and legs entirely pale, hind tibiae not dilated or incurved in middle, and in the abdomen.

Hab. Queensland: Cairns district (Blackburn's collection and A. M. Lea), South Johnstone River (H. W. Brown). Type, I. 5234.

On the male the prothorax is black or almost so, the head is more or less deeply infuscated, the antennae have five or six of the basal joints partly or entirely pale, the following joints blackish, the apical half of the eleventh joint, however, is conspicuously paler than its basal half; the apical half of the femora and parts of the tibiae are also more or less deeply infuscated; on the female the only dark parts are four or five joints of the antennae (the tips being pale as in the male). The hind tibiae of the male have a narrow impression on the upper-surface, marking off the dilated inner portion. The joints of the club are compressed so that, although considerably wider than the preceding joints, from some directions they appear to be of the same width. The X-shaped impression on each side of the prothorax is distinct from most directions, especially on the male, but its parts are of uneven depths. On some parts of the elytra the punctures appear to be slightly geminate in arrangement, but posteriorly their systematic arrangement disappears.

EROTENDOMYCHUS gen. nov.

Head small; clypeus narrow, labrum small. Eyes small, lateral, prominent, coarsely faceted. Antennae with three-jointed club. Palpi small, apical joint conical. Prothorax widely transverse, sides finely margined, without deeply impressed sublateral or basal lines. Scutellum small. Elytra rather long, closely applied to prothorax; epipleurae narrow, and disappearing beyond middle. Mesosternum with intercoxal process subconical, its tip rounded and produced to between bases of front coxae. Metasternum elongate; side pieces narrow. Abdomen with basal segment slightly longer than three following ones combined, these subequal, fifth slightly shorter than two preceding ones combined. Legs moderately long, front coxae almost touching, their cavities open behind, middle coxae moderately the hind ones widely separated; femora unarmed; tibiae rather

thin, but somewhat dilated to tips; tarsi four-jointed, third joint small, claws simple. Wings atrophied.

Apparently an aberrant genus of the Endomychidae (Leconte records *Alexia* as being without the characteristic sculpture of the pronotum of that family); at first glance the species described below appears to be a small erotylid, but the tarsi are truly tetramerous, the third joint (although larger than in most Australian genera of the Endomychidae) being much smaller than the second, not hairy and slightly produced under the base of the claw-joint. The prosternum is ridged along the middle, and, when closely applied to the mesosternum, the ridge appears to touch the intercoxal process of the latter; it really, however, does not extend to between the middle of the front coxae. Closely embracing each hind coxa there is, on the abdomen, a narrowly impressed line, but the space enclosed could hardly be regarded as an abdominal plate, as in many of the Erotylidae. Some specimens have thicker and longer legs and antennae than others, and these are probably males, but there are apparently no distinct external indications of sex. A second species, from Mount Tambourine, is in the Museum, but as it is represented by an entirely pale (probably immature) specimen, it has not been described.

EROTENDOMYCHUS BIMACULATUS sp. nov.

Plate iv, fig. 10.

Red or reddish-castaneous, most of pronotum and two large spots on elytra black. Upper-surface glabrous, under-surface, legs and antennae minutely pubescent.

Head with minute punctures; clypeus convex in middle, depressed on each side. Antennae extending to about middle of metasternum, first joint moderately large, second-eighth about as long as wide, or slightly transverse, ninth larger and more transverse, tenth still larger, eleventh slightly longer and wider than tenth. Prothorax almost twice as wide as long, sides gently incurved near base, hind angles almost rectangular, the front ones rounded, apex gently incurved to middle, base bisinuate; with rather sparse and small but sharply defined punctures, becoming more numerous on sides and parts of base. Elytra at base slightly wider than prothorax, widest at about basal third, thence evenly rounded to apex; with rows of rather small punctures. Under-surface with sparse and minute punctures. Length, 2·75–3 mm.

Hab. Victoria: Dividing Range (Blackburn's collection); New South Wales: Mittagong (A. M. Lea). Type, I. 11802.

A rather elongate-elliptic, flat species. On most of the specimens the pronotum is entirely black, or with the front angles at most obscurely diluted with

red, on others the front angles are distinctly reddish, on one specimen the red extends across the whole apex (and its elytral spots are deeply infuscated instead of black); the elytral spots are median and are usually round, each occupies about two-thirds of the space between the suture and side; but, on the only specimen from Mittagong, the spots are dilated so as to form a fascia occupying rather more than the median third (except that the suture is obscurely diluted with red). On some specimens the base of the prothorax has a small vague depression on each side, but on most of them the base is quite flat. The elytral punctures are small and rather distant in the rows, without the least evidence of striation (except close to the suture posteriorly); from most directions they appear to be sparsely scattered at random.

GEOENDOMYCHUS gen. nov.

Head rather wide, clypeal sutures distinct. Eyes small, lateral, prominent, coarsely faceted. Antennae with nine joints, three forming a club. Apical joint of maxillary palpi rather large and subconical; of labial palpi rather large and dilated to apex, but scarcely securiform. Prothorax widely transverse, with a rather deep curved impression towards each side. Scutellum small. Elytra short, sides strongly rounded and subcontinuous with those of prothorax; epipleurae wide, almost flat, and continuous to apex. Prosternum with a rather wide, flat, bistriated intercoxal process, its posterior end truncated. Metasternum moderately long, episterna narrow. Abdomen apparently composed of six segments, but the apical one small and extrusible. Legs not very long, front coxae subglobular, their cavities widely open posteriorly, middle and hind coxae widely separated; femora unarmed; tibiae rather thin; tarsi thin, apparently three-jointed; claws simple.

At first glance *G. pubescens* looks like a short *Scymnus* or *Rhizobius* of the Coccinellidae, and under a high power I cannot make out the tarsi to be anything but three-jointed; but the nine-jointed antennae, nonsecuriform palpi, and sculpture of prothorax exclude it from that family. The wings are long, thin and hardly more than filaments, not fringed (as in the Corylophidae), and certainly useless for flight. The mandibles are bifid. Type of genus: *G. pubescens.*

GEOENDOMYCHUS PUBESCENS sp. nov.

Castaneous, elytral epipleurae, legs, antennae and palpi somewhat paler. Moderately clothed with short, pale, subdepressed pubescence.

Head feebly convex, with sparse punctures. Antennae moderately long, first joint stout, its base partly concealed, second and third elongate, second stouter than third, fourth short, fifth and sixth still shorter, seventh subglobose, about twice as long and twice as wide as sixth, eighth scarcely longer but more

transverse, ninth briefly obpyriform, slightly wider and distinctly longer than eighth. Prothorax at base fully four times as wide as the median length, sides strongly rounded and finely margined, apex deeply emarginate and about half the width of base, base widely bisinuate and feebly margined, a deep, narrow, curved stria near each side, but terminated before middle; punctures inconspicuous. Elytra scarcely longer than greatest width (at about basal fourth), strongly and evenly convex, sides finely margined; with dense and small but in places fairly distinct punctures; epipleurae faintly wrinkled, feebly diminishing in width posteriorly. Length, 1·5–1·75 mm.

Hab. Lord Howe Island (A. M. Lea). Type, I. 11803.

A short strongly convex species of which twenty-two specimens were obtained by sieving fallen leaves. The base of the prothorax is very narrowly infuscated; three specimens are entirely flavous, probably from immaturity; another has the medio-basal portion of the elytra slightly stained with piceous. The pubescence appears to be easily abraded.

GEOENDOMYCHUS GLABER sp. nov.

Castaneo-flavous, appendages slightly paler. Prothorax and elytra glabrous, elsewhere feebly pubescent.

Head gently convex, a feeble depression near each eye; punctures inconspicuous. Antennae nine-jointed, two basal joints rather large; club three-jointed. Prothorax at base fully four times as wide as the median length, sides strongly rounded and very finely margined; apex rather deeply emarginate, a narrow deep line near each side, with which it is parallel, traceable from base to apex; impunctate. Elytra with outlines subcontinuous with those of prothorax, sides strongly rounded and finely margined; with minute punctures. Intercoxal process of prosternum dilated to and truncated at posterior end, a fine stria on each side. Length, 1·3–1·5 mm.

Hab. Queensland: Hamilton (C. J. Wild); New South Wales: Richmond River, from a nest of termites (A. M. Lea). Type, I. 12029.

The outlines, under-parts, legs, antennae and palpi are much as in the preceding species, from which it may be readily distinguished by its glabrous upper-surface, and longer sublateral striae of prothorax.

ENCYMON CLAVICORNIS Blackb.

Mr. Arrow(5) states that this species is an *Encymon;* it was originally referred to *Mycella,* but subsequently made the type of the new genus *Cranterophorus.* The type was described as blackish-aeneous, with the prothorax

(5) Arrow, Trans. Ent. Soc. Lond., 1920, p. 3.

and femora red, such as is common with specimens from New South Wales and Queensland; but occasionally the elytra are purple. A specimen, from Aru, has purple elytra, but otherwise agrees with the typical form. Many specimens from New Guinea (St. Joseph's River and the Madang district) have the legs uniformly black and the elytra violet.

MYCELLA LINEELA Chp.

The markings of this species consist of a long pale vitta on each elytron, conjoined or not to a small outer spot near the base, occasionally the latter being absent.

PERIPTYCTUS RUSSULUS Blackb.

This species occurs in Tasmania (Wilmot, Ulverstone, Mole Creek, and Hobart) and New South Wales (Forest Reefs), as well as in Victoria.

var. BILINEATUS var. nov.

Ten specimens, from Forest Reefs, differ from the common form in having a distinct infuscated line towards each side of the prothorax, instead of the discal portion rather lightly infuscated, but as they were obtained with specimens of the typical form, and are structurally the same, I cannot regard them as representing more than a variety.

FAMILY CORYLOPHIDAE.

APHANOCEPHALUS PUNCTULATUS Blackb. (formerly ELEOTHREPTUS).

On the typical form of this species the prothorax, except that the sides are pale, and elytra are of a very dark brown; but on some specimens those parts are black or almost so; others have the whole upper-surface of a dingy brown. It was referred to the Endomychidae by Blackburn, who proposed a new genus for it, but Arrow,(6) from examination of the type, referred it to *Aphanocephalus* (Corylophidae). It occurs in Victoria (Alps, Geelong, and Forrest), as well as in South Australia.

APHANOCEPHALUS POROPTERUS sp. nov.

Blackish, sides of prothorax and most of under-surface obscurely paler, legs still paler; elytra with flavous markings. Moderately clothed with short, ashen pubescence.

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(6) Arrow, Trans. Ent. Soc. Lond., 1920, p. 3.

Head with small, dense punctures on basal half. Antennae with first and ninth joints large, the latter forming a club. Prothorax widely transverse, sides strongly rounded and distinctly margined, apex gently incurved to middle and about half the width of base; with dense and small but sharply defined punctures. Elytra slightly wider than prothorax, sides distinctly margined; with dense and rather coarse punctures. Under-surface with dense and sharply defined but not very large punctures, larger on sides of metasternum and on basal segment of abdomen than elsewhere. Length, 1·5 mm.

Hab. Queensland: Cairns district (A. M. Lea). Type (unique), I. 11797.

Very distinct by the coarse punctures and distinct markings of elytra; the latter may be variable; on the type they consist, on each elytron, of a small spot on the shoulder, a somewhat S-shaped mark extending, near the suture, from close to the base to the middle, and an elliptical mark (enclosing a dark spot) obliquely placed on the apical third. The margin of each elytron, on its apical third, appears as a series of three short straight lines, instead of being evenly rounded.

APHANOCEPHALUS NITIDUS sp. nov.

Black, sides of prothorax, tips of elytra and most of under-surface obscurely paler, elytral epipleurae and legs still paler. Under-surface and legs finely pubescent, upper-surface scarcely visibly so.

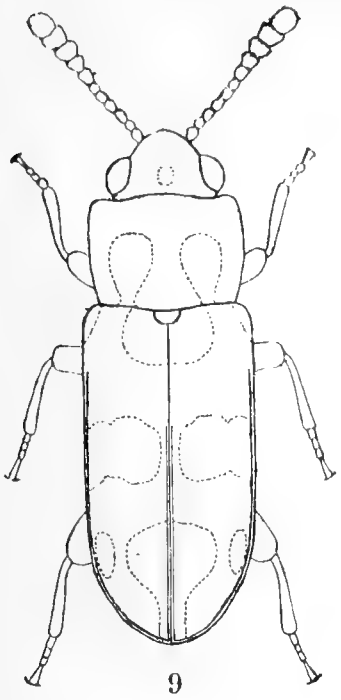
Head with dense punctures, sharply defined near base, but much less distinct in front. Antennae with ninth joint forming a rather large truncated club. Prothorax widely transverse, sides strongly rounded and finely margined, apex incurved to middle and scarcely half the width of base; with dense and small but rather sharply defined punctures. Elytra with outlines continuous with those of prothorax, but margins somewhat wider; the punctures somewhat sparser and slightly larger. Under-surface with dense punctures, slightly larger on sides of metasternum and on basal segment of abdomen than on elytra. Length, 2·25–2·5 mm.

Hab. Queensland: Mount Tambourine (A. M. Lea). Type, I. 11798.

Larger and more shining than *A. punctulatus* and *A. potamophilus*, upper-surface with very indistinct pubescence, and punctures much smaller. A second specimen is somewhat smaller and paler than the type.

Explanation of Plate iv.

Fig. 1. *Macrogonus maculatus* Lea. 1a, prothorax of female.
Fig. 2. *Episcaphula nigronotata* Lea.
Fig. 3. *Episcaphula atromaculata* Lea.
Fig. 4. *Thallis vinula* Er.
Fig. 5. *Thallis alternata* Lea.
Fig. 6. *Thallis subtuberculata* Lea.
Fig. 7. *Thallis hoplostetha* Lea. 7a, side view of prosternum of male.
Fig. 8. *Thallis metasternalis* Lea.
Fig. 9. *Thallis tricolor* Lea.
Fig. 10. *Erotendomychus bimaculatus* Lea, tarsus.



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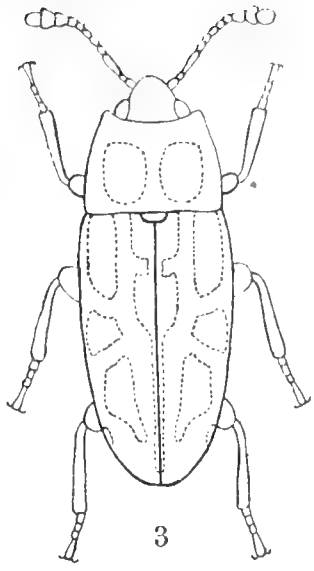

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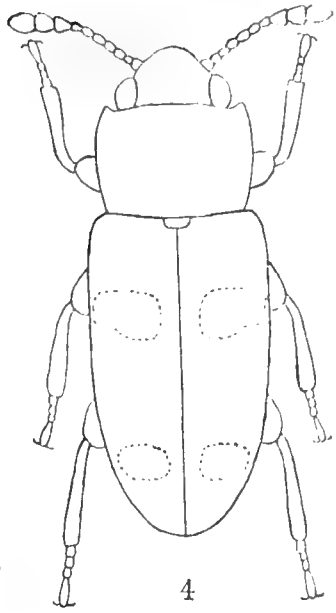

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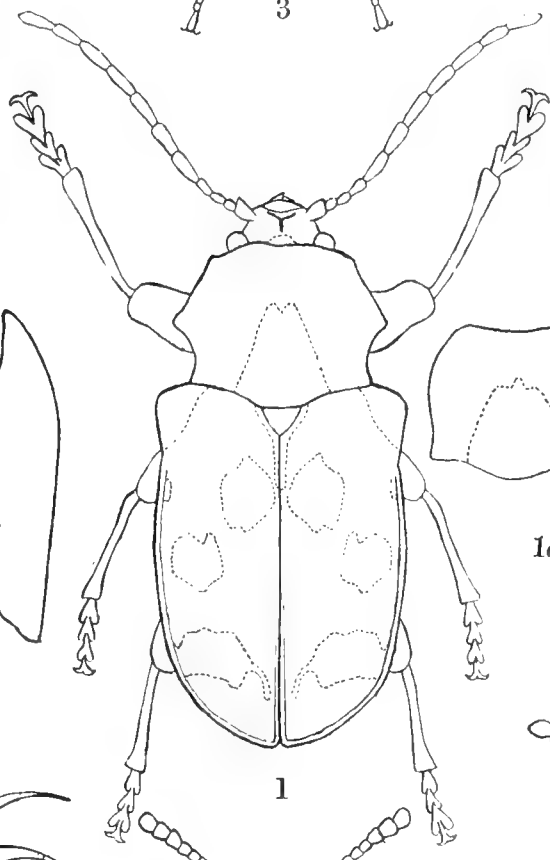

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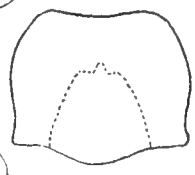

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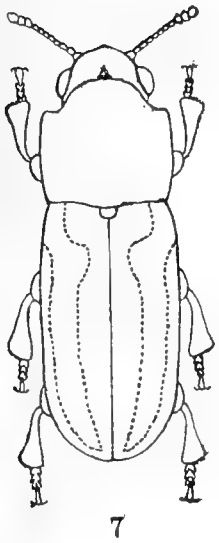

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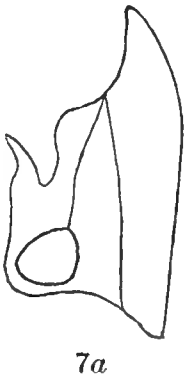

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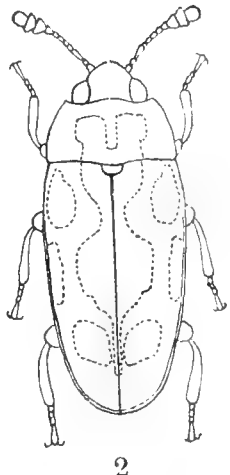

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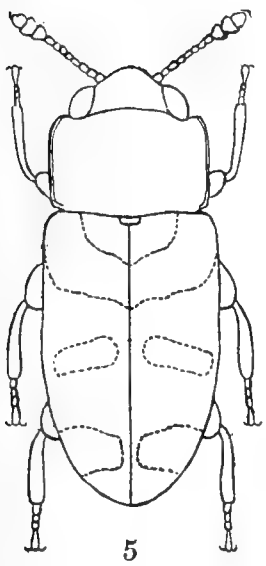

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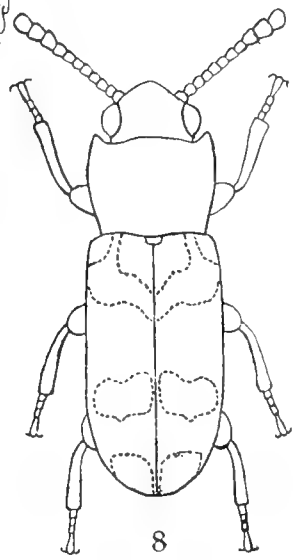

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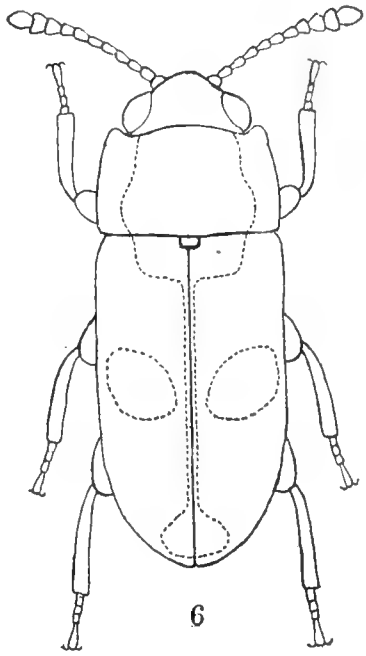


6

AUSTRALIAN BEETLES

STUDIES IN AUSTRALIAN AQUATIC HEMIPTERA

No. I.

By HERBERT M. HALE, South Australian Museum.

Family CORIXIDAE

Text figs. 338–350.

The Corixidae, popularly known as water-boatmen, differ considerably from all other Cryptocerata. The head (fig. 338A), which is about as wide as the thorax, is obliquely recurved below, the apex reaching to between the anterior coxae; the mouth is very short, flattened, and the aperture through which the setaceous mouth parts are protruded is situated above the tip of the clypeus. The eyes are large and widely separated and the hinder margin overlaps the prothorax. Each pair of legs is of different form and utility. The anterior members are short. In *Corixa* and sub-genera the tarsus or pala is extremely modified, particularly in the male, and varies in shape in the different species: it consists of a single scoop-like joint, and seen sideways is generally falcate or cultrate (fig. 338B); the lower margin is furnished with two rows of bristly hairs, in one of which rows the hairs are very long. On the inner surface of the male pala are one or more rows of chitinous teeth or pegs, and it is considered that the characteristic stridulation beneath the water is produced by rubbing this tarsal comb across an area, also covered with tiny pegs, and situated near the base of the opposite femur. As pointed out by Kirkaldy(1) and others, the number of pegs in the comb affords a useful distinguishing specific character.

In *Micronecta* the pala of the male terminates in a large flattened claw (fig. 346), which in the female is represented by a stiff seta.

The middle legs are long and attenuated and each terminates in two slender claws; the posterior tarsus is flattened, broadened, and fringed with long hairs.

The life colouration is a little variable, immature imagos being usually paler. After death some changes are apparent: irregular infuscations, having no relation to the general colour scheme, sometimes appear; in the descriptions no note is made of inconstant and irrelevant staining; in specimens not fully adult the colour becomes yet paler, while the external parts may shrivel so that the relative proportions are destroyed.

(1) Kirkaldy, Journ. Quekett Micro. Club (2), viii, 1901, p. 35 (Bibliography) and Proc. Hawaiian Ent. Soc., i, 1906, p. 15.

The odour which is characteristic of Heteropterous bugs generally is noticeable, but not pronounced, in members of this family.

Habits. With the aid of the oar-like hind-legs the Corixidae propel themselves rapidly through the water, or anchor themselves to aquatic plants or other submerged objects by means of the long intermediate tarsal claws; a copious supply of air is carried under water, and the insects remain below the surface for long periods. Living animal food is captured with the anterior legs, with which prey is firmly grasped while the nutriment is extracted. Professor H. B. Hungerford(2) states that they are largely herbivorous, and under his observation a species subsisted throughout the life cycle upon the brown sedimentary material which occurs on the bottoms of pools. In 1873 F. B. White(3) wrote: "On examining a stone from which a *Corixa* had apparently been obtaining food, a

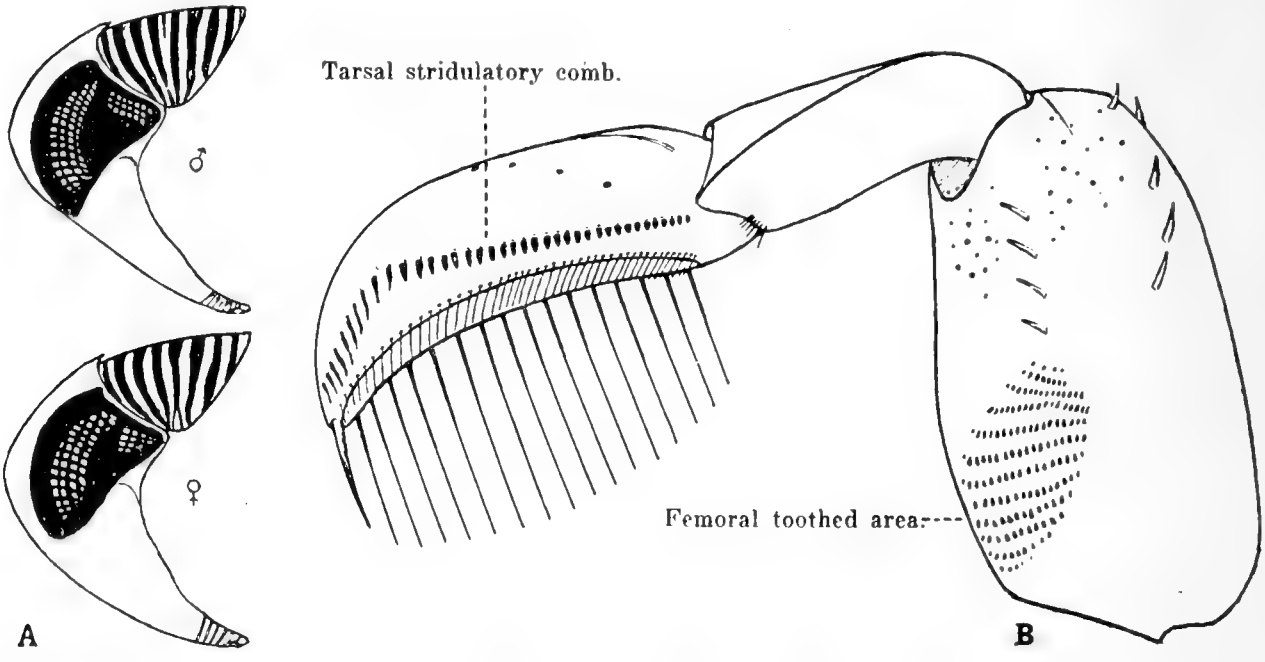


Fig. 338. *Arctocorisa australis*; A, profile of head; B, anterior leg of male.

small *Alga* and a few *Rotifera* and other animalcules were seen." The Indian *Micronecta striata*(4) (*Corixa ovivora* Westwood) is reported to feed upon the eggs of fishes.

For months I kept in aquaria several species of Corixidae, as well as members of Notonectidae and Naucoridae, and during that time they were fed only upon larvae of *Culex fatigans* and *Scutomyia notoscripta*. Even newly-hatched Corixidae were observed to capture tiny mosquito larvae, increasingly large examples being taken during the successive stages of the metamorphosis. If, as

(2) Hungerford, Science, n.s., xlv, 1917, p. 336.

(3) White, Ent. Month. Mag., x, 1873, p. 79.

(4) Westwood, Proc. Ent. Soc., 1871, p. iv.

seems certain, aquatic bugs feed upon these larvae in their native ponds, there is every reason to suppose that they mitigate the mosquito nuisance, and are thus of considerable economic importance. The malaria-carrying mosquitoes particularly, breed in isolated pools and temporarily inundated grass-grown hollows, localities in which fishes do not usually occur, but to which aquatic bugs, possessing the power of flight, have easy access.

Reproduction. Excepting in *Diaprepocoris*, the sexes are easily distinguished, the structure of the pala alone being sufficient indication. The abdomen of the female is symmetrical, while in that of the male the segments are irregular and distorted (fig. 339A). The male is often also provided with a curious organ, situated on the sixth segment of the upper side of the abdomen. This was discovered by F. B. White(5) and designated the strigil or strigiliform process. It consists of a somewhat convex disc mounted on a pedicel, and composed of overlapping, striated, chitinous plates, the striae being directed inwards (fig. 345s):

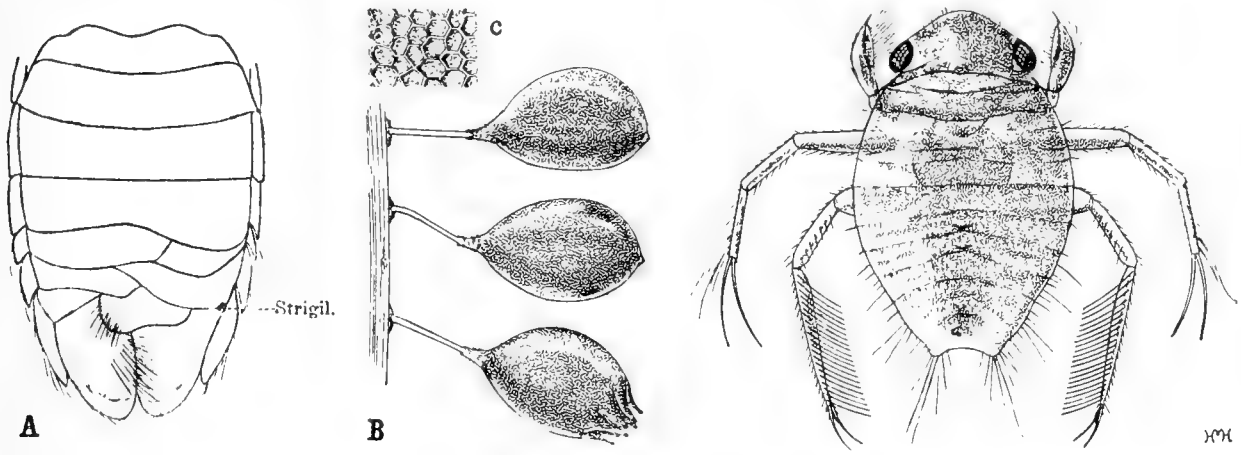


Fig. 339. *Porocorixa eurynome*; A, upper side of abdomen of male; B, eggs and larva, probably of this species.

the utility of this structure is not clear, but it has been suggested that it constitutes portion of a secondary stridulatory apparatus, possibly used during flight. In the hitherto unknown male of *Diaprepocoris* there it yet another form of abdominal apparatus, also apparently stridulatory (fig. 350s).

Although a species may vary in size in different localities, the females are, as a rule, slightly larger than the males.

Fig. 339B shows the eggs and newly-hatched larva of an Australian species, probably *Porocorixa eurynome*. In autumn (April) 1921, numbers of the ova were deposited on the thicker stems of a water-plant (*Potamogeton* sp.) in the Torrens River, Adelaide; the smooth stems of a grass overhanging the banks, and in places submerged, were also utilized, but the ova were always attached to

(5) White, *loc. cit.*, p. 60.

vegetation shallowly situated in the slowly running stream. The eggs are about 1·0 mm. in length, irregularly oval in shape, and somewhat flattened on one side; the micropyle is situated in a nipple at the apex; the surface is minutely wrinkled and is marked with a rather uneven, tiny, reticulating pattern, consisting mostly of hexagons, but with occasionally a five-sided figure interposed (c). Each egg is borne on a translucent, thread-like pedicel connected to a disc, which is firmly attached to a plant stem. The pedicel, notwithstanding its fragile appearance, is extraordinarily strong, flexible, and elastic; on being stretched to about four times its normal length it readily returns when released. If sufficient force is used to drag the egg from the object to which it is connected, the disc usually becomes detached, but the connecting pedicel rarely breaks.

As development proceeds the eyes of the enclosed embryo become increasingly visible on each side, at about the apical third of the egg-case; seen through the semi-transparent chitin they appear reniform and of a castaneous colour. In hatching, the larva bursts open the top of the egg-case, the apex being split into several teeth. The newly-emerged bug is 2·5 mm. in length and, excepting for the eyes, is almost transparent, with very faint traces of pigment. The compound eyes are small and consist of comparatively few facets, the interocular space being much wider than in the adult. The posterior tarsus is provided with two terminal claws, and throughout the immature stages is monomerous.

In an aquarium the late pupal stage was attained five months after hatching, when the bugs unfortunately perished before the identity of the species could with certainty be established.

The Corixidae are of almost world-wide distribution. Six species have hitherto been recorded from Australia, five of these being named by Kirkaldy and one by Fieber. Eight additions are herein recorded, some of which have a wide range over the continent; the types are deposited in the South Australian Museum. Several species are often associated in the same situation, and recently a single pool near Adelaide yielded eight of those enumerated in this paper. A single specimen only has been received from Western Australia; more must, of course, occur there, and doubtless further species remain to be recorded from this and other States. In 1893 Skuse(6) wrote: "Three species of *Corixa* common in the ponds about Sydney," and "Two species, rather abundant," of *Sigara (Micronecta)*. No other paper dealing with the Cryptocerata has been published in Australia.

I here express my thanks to Mr. W. W. Froggatt, of the Agricultural Department, Sydney, and to the Directors of the Australian Museum, Sydney, and National Museum, Melbourne, for the opportunity of examining the Corixidae preserved in these institutions.

KEY TO THE AUSTRALIAN GENERA.

a. Scutellum almost or entirely concealed . . . . . *Corixa* and sub-genera
b. Pronotum and hemelytra more or less rastrate; pronotum with transverse markings . . . . . *Arctocorisa*
bb. Pronotum and hemelytra densely punctured; pronotum without transverse markings . . . . . *Porocorixa* subg. nov.
aa. Scutellum not concealed.
c. Scutellum small; antennae three-jointed . . *Micronecta*
cc. Scutellum large; antennae four-jointed . . *Diaprepocoris*

CORIXA Geoffroy.

Sub-genus ARCTOCORISA Wallengren.

Arctocorisa Walleng., Ent. Tidskr., xv, 1894, p. 159.
Basileocorixa Kirk., Entomologist, 1898, p. 253.

Type, *A. variegata* Walleng.

May be separated from other sub-genera of *Corixa* by the following characters: Face excavated in male, convex in female. Palal comb composed wholly of strong chitinous pegs, none being bristle-like. Pronotum more or less rastrate and with transverse lineations. Hemelytra with vermiculate markings. A strigil present on the right side of abdomen of male.

ARCTOCORISA AUSTRALIS Fieber.

Corixa australis Fieber, Abhand. der königl. böhm. Ges. der Wiss. (5), vii, 1852, p. 232, pl. i, fig. 15; Kirk., Ann. Mag. Nat. Hist. (6), xx, 1897, p. 55.

♂ Head ochraceous, prominent, longer than its width at base between eyes, evenly rounded in front; a longitudinal median carina, slightly produced at basal

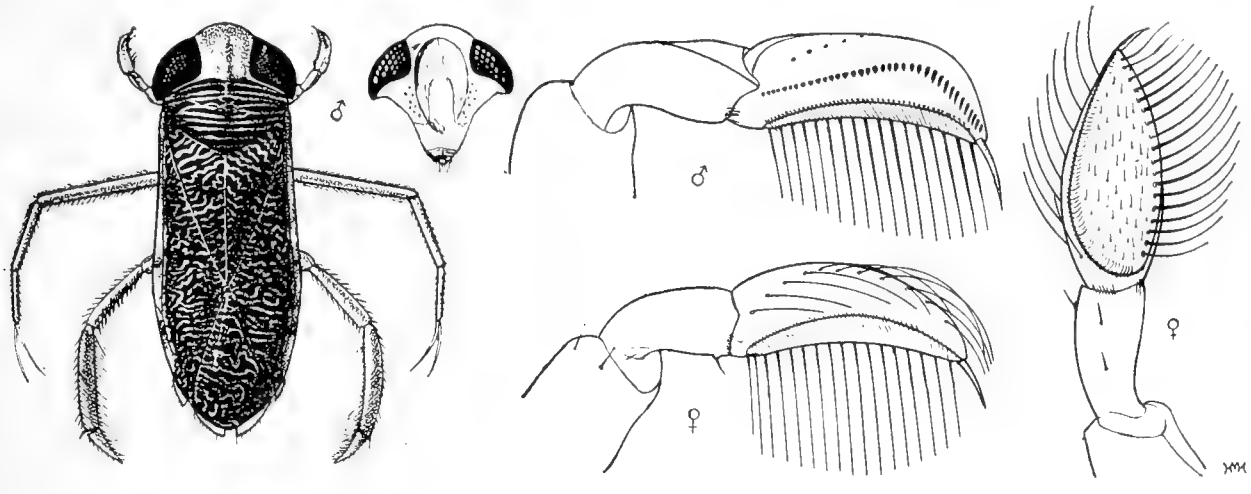


Fig. 340. *Arctocorisa australis*.

margin of head and with an impressed line of punctures on each side and another near the eye; facial impression obovate, large and deep, extending almost to the vertex, clothed with fine pale hairs; eyes directed moderately backwards, beyond and over the anterior pronotal angles, inner margins a little divergent. Pronotum black, crossed by seven to ten narrow, irregular yellow lines; twice as broad between humeral angles as medial length; rastrate and with a median carina, most distinct anteriorly; posterior margin angularly convex, lateral margins short; angles obtuse. Hemelytra black, marked with yellow, sparsely clothed with long, fine, yellow hairs; clavus with sub-transverse, oblique, angularly-wavy lines, the anterior ones broader, so that the base of the clavus appears paler; finely rastrate; corium with angular, interrupted and somewhat transverse lines; a broken yellow line sub-marginal to the costal edge; membrane with transverse lines, twisted on the disc, parallel on the inner margin; embolium dull, pale livid, darkest anteriorly. Sternum ochraceous, in parts black; xyphus blackish, acute; underside of abdomen pale testaceous, darkened anteriorly; connexivum pale yellow; strigil of comparatively large size, sub-rectangular, with four to six broad rows of striae; legs ochraceous; anterior tibiae stout, about four-fifths as long as palae, which are cultrate, the upper margin almost straight for a great part of its length, suddenly bent downwards and forwards to apex; claw long, stout; thirty-six to forty stridulatory pegs in a single row following the curve of the superior margin; apical pegs longest, subulate, the series regularly decreasing in size backwards; posterior teeth short, sub-ovate; intermediate claws about as long as tarsi. Length, 7 mm.

♀ A little larger than the male. Frontal margin of head somewhat angularly rounded; interocular carina continued below on to face, which is convex, punctured, and clothed with pale yellow hairs. Palae falcate, upper edge very convex. Underside of abdomen ochraceous, darkened marginally. In two examples from Murray River the head is dark castaneous. Length, 7·5 mm. to 8 mm.

Hab. South Australia: Adelaide (A. H. Elston and H. M. Hale), Murray River (J. G. O. Tepper and H. M. Hale), Goolwa and Finniss River (A. Zietz); Victoria: Port Phillip (type locality); Tasmania (British Museum).

A. australis is so far recorded from southern Australia and Tasmania only. The female has not previously been described.

ARCTOCORISA TRUNCATIPALA sp. nov.

♂ Head testaceous, a little longer than its width, evenly rounded in front; a longitudinal, median carina, slightly and angularly produced at basal margin

(6) Skuse, Rec. Aust. Mus., ii, 1893, p. 43.

of head; an impressed line of punctures on each side of carina and another bordering the eye; facial impression obovate, very large and deep, extending almost to the vertex and laterally nearly touching the eyes; eyes directed moderately backwards, beyond and over the anterior pronotal angles, inner

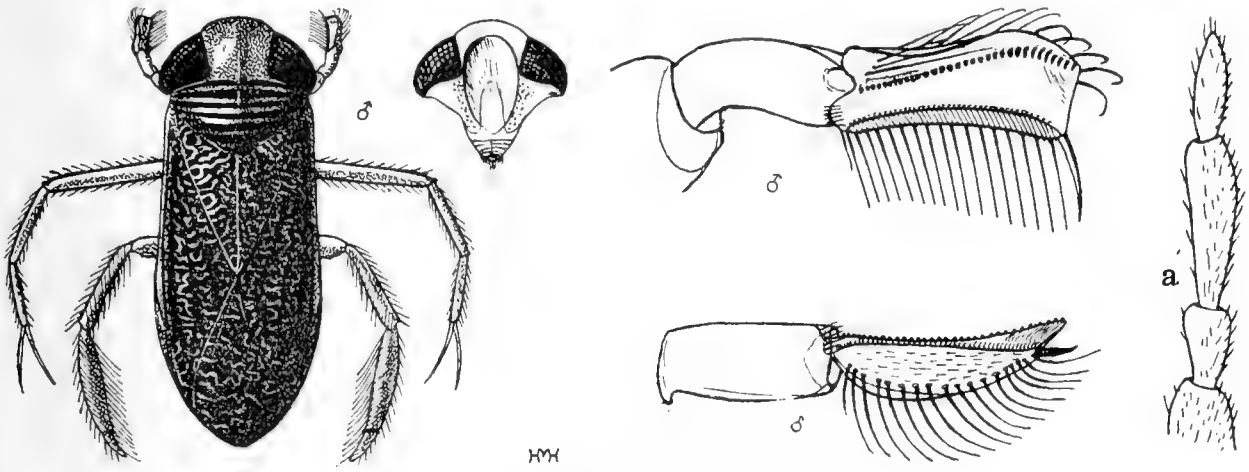


Fig. 341. *Arctocorisa truncatipala.*

margins slightly divergent; fourth joint of antennae more than half as long as the third (a). Pronotum black, crossed by six, slightly curved, greenish-yellow lines; twice as broad between humeral angles as medial length; rastrate and with a median carina, most distinct anteriorly; posterior margin angularly convex; lateral margins short; angles obtuse. Hemelytra black, marked with yellow, sparsely clothed with long, fine, yellow hairs; clavus finely rastrate, basally with five or six narrow, irregular, obliquely-transverse lines; remainder of wing-covers with many short, angularly wavy markings, on the corium arranged in four distinct longitudinal series, the outer series forming an interrupted line bordering the anterior margin, but separated from it by a narrow black interspace; tip of membrane black; embolium dull, livid. Sternum and legs ochraceous; underside of abdomen testaceous; connexivum pale yellow; strigil brownish black, of comparatively large size, sub-quadrate in form, with five broad, more or less regular rows of striae; anterior tibiae stout, about four-fifths as long as palae which, viewed from above, are semi-lunate, narrower at the base; seen sideways they are elongate sub-rectangular, the apex very truncate, as wide as the base and forming a wide angle with the upper and lower edges; base slightly widened; upper edge posteriorly almost straight, a little concave, suddenly convex and bent downwards to the upper apical angle; lower edge gently concave; claw as long as the width of tarsus; thirty-two stridulatory pegs in a single row sub-parallel with the upper margin, extending from the middle of the base to the upper anterior angle; apical pegs longest, subulate, the series regularly decreasing in size backwards, the posterior teeth being stout and sub-oval; intermediate claws about

equal in length to tarsi; tibiae longer; posterior tibiae shorter than tarsi; swimming hairs dark brown. Length, 5·8 mm. to 6·5 mm.

♀ More robust than the male. Head slightly shorter, the frontal margin somewhat angularly rounded; interocular carina extending below on to the face, which is convex, punctured, and with sparse yellow hairs. Palae much as in the female of *A. australis*. Length, 5·8 mm. to 7 mm.

Hab. South Australia: Adelaide (type locality, H. M. Hale, A. H. Elston, and Mulvin), Murray River (H. M. Hale), South East (Ziegler), Lucindale (B. A. Feuerheerdt), Myponga (A. H. Elston), Goolwa and Finniss River (A. Zietz); New South Wales: Sydney (Australian Museum), Bungendore, Clarence River, and Hay (A. M. Lea); Victoria: Melbourne (Searle); Tasmania: (A. Simson), Hobart (A. M. Lea). Type, I. 15183.

A. truncatipala is allied to the preceding species, but the form is more robust and the head is scarcely as prominent; the pronotal lines are broader and usually in less number, and the hemelytral markings are more broken. It may be readily recognized by the form of the male pala, which does not taper to a point, but terminates in a straight, knife-like edge; this pala is figured as seen sideways and from beneath. In a large series the following variations occur: Six to eight transverse lines on the pronotum, generally regular, but sometimes forked, looped or conjoined; the former number is more usually present. Thirty-two to thirty-five pegs in the palal comb. The intermediate claws vary in length and may be as long as the tibiae. The sternum is sometimes nigrescent and the xyphus and coxae black.

The species is plentiful in the rivers near Adelaide during the summer. Pupae and immature imagos are of bright lemon colour with very faint markings, which rapidly darken as development proceeds; an orange streak margins the base of the head. The light lines and vermiculations of a living mature example are barely discernible to the naked eye, the bug appearing almost black.

ARCTOCORISA SUBLAEVIFRONS sp. nov.

♂ Head ochraceous, basally testaceous, about as long as width at base between eyes, rounded and very little produced in front; with a median, interocular carina, slightly produced at hinder margin of head; an impressed line of punctures on each side of the carina and another less distinct series near each eye; face flattened, punctured; impression hardly discernible, closely punctured, clothed with yellow hairs; very shallow, short, and narrowly ovate; eyes directed backwards, beyond and over the anterior pronotal angles, the inner margins a little divergent. Pronotum brownish-black, crossed by eight narrow irregular,

yellow lines; nearly twice as broad between humeral angles as medial length; rastrate, and with a median carina, most distinct anteriorly; posterior margin angularly convex; lateral margins short; angles roundly obtuse. Hemelytra brownish-black, marked with yellow, with a few fine yellow hairs; sutures margined with yellow; clavus with oblique, sub-transverse, angularly-wavy lines, rastrate; corium with fragmentary wavy lines, arranged in four rather ill-defined longitudinal series; markings on membrane transverse anteriorly, sub-parallel on inner margin and twisted on the disc; embolium pale yellow. Sternum and legs ochraceous; underside of abdomen pale testaceous; strigil dark brown, large, roundly sub-quadrate, with six rows of striae; anterior tibiae stout; palae cultrate,

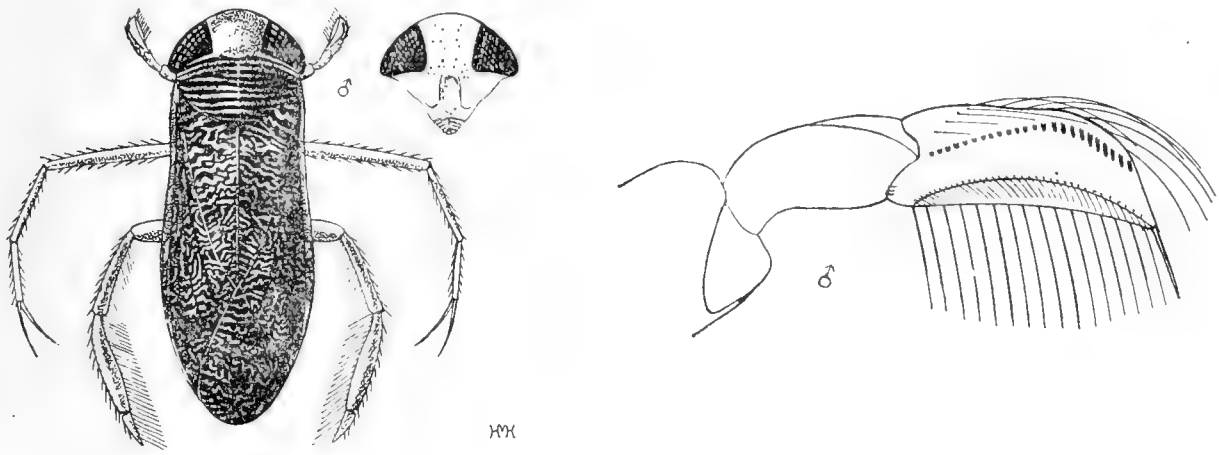


Fig. 342. *Arctocorisa sublaevifrons*.

sub-truncate, narrowest at base; upper margin almost straight, slightly sinuate, and anteriorly suddenly bent obliquely downwards and forwards to apex; claw rather weak; twenty-four short stridulatory pegs in a single row sub-parallel to the superior margin, not reaching to apex; anterior pegs longest, the series regularly decreasing in size backwards; intermediate claws as long as the tarsi. Length, 6 mm.

♀ Slightly larger and more robust than the male. Palae as in female of *A. australis*, but head shorter.

Hab. Victoria: Coromby (type locality, J. G. O. Tepper), Melbourne and Plenty River (Searle), Croydon, Gumbower, and Mount Macedon (National Museum). Type, I. 15184.

The variation is as follows: Pronotal lines seven to eight; palal pegs twenty-one to twenty-four.

Like *A. australis*, this species is of elongate form, but the head is less produced in front. The male differs in the slight facial impression and lesser number of palal pegs.

POROCORIXA subg. nov.

Pronotum and hemelytra densely punctate, clothed with short hairs; pronotum without transverse lines; no vermiculate or angulate markings on wing-covers. Male with facial impression, and a strigil on right side of abdomen; face of female convex. Pala with a terminal claw, pegs of stridulatory comb strong.

Type, *Corixa eurynome* Kirkaldy.

Resembles the African *Agraptocorixa* Kirkaldy, but in that genus the pronotum is lightly punctate-rugose and no mention is made of punctation on the hemelytra.

POROCORIXA EURYNOME Kirkaldy.

Corixa eurynome Kirk., Ann. Mag. Nat. Hist. (6), xx, 1897, p. 54.

♂ Head ochraceous or testaceous, about as long as wide, a little tumid in front, almost evenly concave posteriorly; with a coarse, median longitudinal, interocular carina, on each side of which is an impressed line of punctures, closely

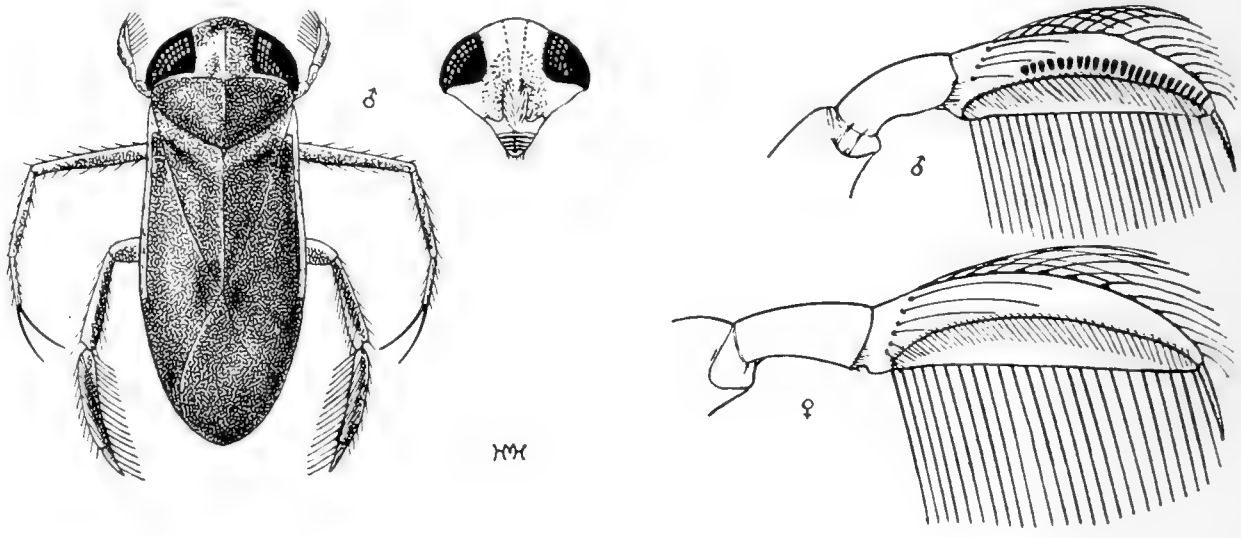


Fig. 343. *Porocorixa eurynome*.

set posteriorly, but becoming more scattered towards the vertex; another line of punctures near each eye, curved inwards near base of head to meet the first series; face ochraceous, punctate, clothed with fine yellow hairs; with a slight depression extending to well above inner margins of eyes, and a shallow, rather narrow, obovate, interior impression reaching to between inner angles of eyes; eyes directed backwards, a little beyond and over the anterior pronotal angles, the inner margins almost parallel, slightly divergent; terminal joint of antennae very short. Pronotum dark olivaceous-brown (appearing almost black in fresh adult examples), clothed with very short black hairs; twice as broad between humeral

angles as medial length, with comparatively large, crowded punctures, almost confluent; anterior margin medianly incised; posterior margin angularly convex; lateral margins short, oblique; angles subacute. Hemelytra dark olivaceous-brown, paler basally; with closely-set punctures as on pronotum, but with longer black hairs; clavus with a short, dark streak near lateral basal angle, sub-parallel with the suture, and a dark marking at the inner and apical angles; claval suture narrowly margined with black; corium darkened at angles and opposite the termination of the embolium, which is pale. Sternum ochraceous; underside of abdomen black anteriorly, testaceous posteriorly, clothed with a very fine, pale pubescence; connexivum testaceous; strigil very small, roundly sub-quadrate, with four broad rows of striae; legs ochraceous, tibiae and tarsi more or less darkened; anterior tibiae about half as long as the palae, which are falcate, evenly rounded above, narrower at the base; claw strong, the inner edge serrate; a single row of about twenty-three stridulatory pegs, following the curve of the lower margin and extending from the apex to three-fourths of the length; apical pegs long, acute, the remainder sub-oval, pointed; intermediate claws as long as, or a little longer than the tarsi, which are little more than half the length of the tibiae; first joint of posterior tarsi as long as the tibiae; swimming hairs black. Length, 8·5 mm. to 9 mm.

♀ Interocular carina, and punctures on head and face, as in male; the slightly depressed area on the face is somewhat raised centrally; face testaceous, with yellow hairs. Underside of abdomen testaceous, posterior segments sometimes darkened; palae relatively longer, but more slender, than in male; claw apparently not serrate. Length, 9 mm.

Hab. South Australia: Adelaide (J. G. O. Tepper and H. M. Hale), Murray River and Bordertown (J. G. O. Tepper), Blakiston (Driffield); Queensland: Townsville (F. P. Dodd); New South Wales: Mittagong and Clarence River (A. M. Lea); Victoria: (Blackburn), Plenty River (Searle), Mallee (National Museum, and O. Donohue).

It is with some doubt that specimens from the above localities are referred to this species. The author describes the hemelytra as "paler at the base (owing to absence of punctuation)"; in examples now identified the punctures extend over the whole of the wing-covers, excepting the very small, dull, blackish portion which is covered by the pronotum. Both sexes have a longitudinal, median carina on the head, a character assigned only to the female in the original description; the facial impression of the male does not extend "almost to the vertex," and the clothing is dark. The type is from Adelaide River, Northern Territory (British Museum).

POROCORIXA PARVIPUNCTATA sp. nov.

♂ Head pale ochraceous, wider than long, almost straight in front, scarcely produced in front of eyes; posterior margin sinuate, medianly angular; crown not conspicuously convex, with a very indistinct interocular carina; a line of small punctures on each side of the median line of the head and another series bordering the inner margin of each eye and bent inwards near the base of the head; face with a punctate, shallow, obovate depression reaching to just above inner angles of the eyes; a small, narrow, interior impression, reaching to between inner angles of eyes; eyes directed moderately backwards, inner margins parallel above, converging on face. Pronotum olivaceous-brown, in parts diluted, clothed with short black hairs, more than twice as broad between humeral angles as medial length; punctures minute, confluent, and forming fine, transverse wrinkles; a

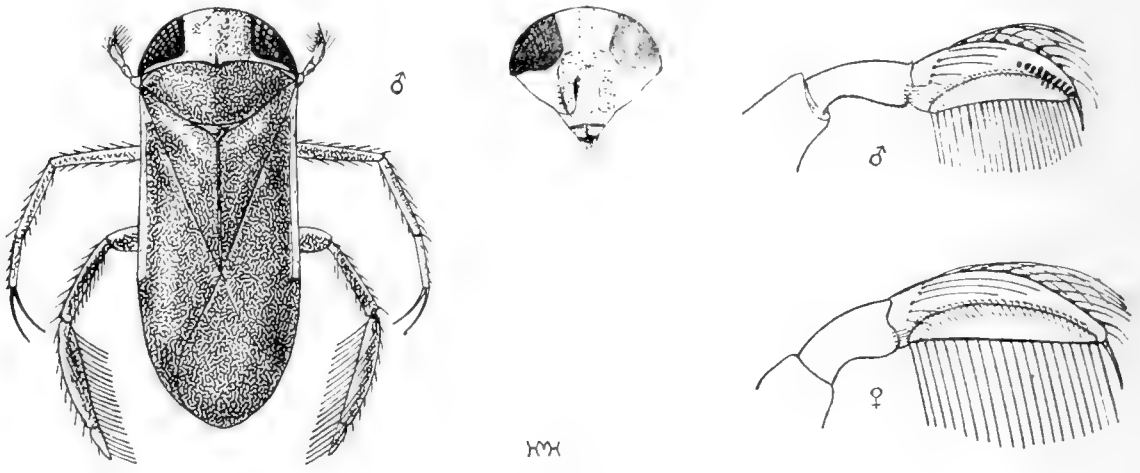


Fig. 344. *Porocorixa parvipunctata.*

feeble median, longitudinal ridge; anterior margin convex, slightly incised medianly; posterior margin sinuately convex; lateral margins very oblique; angles very acute. Hemelytra dark olivaceous-grey, in parts darkened, finely punctured and with black hairs; clavus testaceous basally and darker at angles; corium darkened anteriorly, at apex and below termination of the embolium, which is pale livid with the outer margin black. Sternum pale ochraceous; underside of abdomen dark testaceous, clothed with a fine, yellow pubescence; connexivum yellow, in parts black; strigil black, very small, roundly sub-triangular, with two broad rows of striae; legs testaceous; anterior tibiae more than half as long as palae, which are falcate, evenly convex above, narrower at the base; claw rather short; one short row of ten stridulatory pegs, situated on the apical third of the tarsus; middle pegs longest and stoutest, posterior four conspicuously shorter; intermediate tarsi more than half as long as tibiae, about as long as claws; posterior tarsi longer than tibiae; swimming hairs brown. Length, 6 mm.

♀ Head darkly suffused at base, shorter than in the male; face furnished with yellow hairs; convex, finely punctured. Underside of abdomen testaceous, posterior segments sometimes darkened. Anterior tibiae relatively shorter, and palae longer and narrower than in male. Length, 6 mm. to 7 mm.

Hab. South Australia: Adelaide (type locality, H. M. Hale), Mount Lofty Ranges (S. H. Curnow), Reynella (G. Dutton), Murray River (H. S. Cope and H. M. Hale), Bordertown (J. G. O. Tepper), Myponga and Barossa (A. H. Elston), Northern Flinders Ranges (A. H. Elston and H. M. Hale); Central Australia: Opossum Creek ("W. H.," Horn Expedition, 1896), Higgin's Dam (South Australian Museum Expedition, 1916); Queensland: Claudie River, N.Q. (J. A. Kershaw), Longreach (A. M. Lea), Charters Towers (Mrs. Black); New South Wales: Broken Hill (F. W. Shepherd), Bungendore and Hay (A. M. Lea), Wagga and Tamworth (W. W. Froggatt); Victoria: Dimboola (J. G. O. Tepper), Melbourne, Plenty River and Wattle Park, Balwyn (Searle); Tasmania: Hobart (A. M. Lea). Type, I. 15185.

This widely distributed species somewhat resembles *P. eurynome*, but is of smaller size and more finely punctured. The head is shorter and less produced in front; the basal margin is more angulated in the middle, so that the posterior angles of the eyes are farther from the margin. The facial impression of the male is less distinct and there are only ten or eleven palal pegs.

During life the head is bent down rather more than is shown in the figure, and seen from above appears much wider than its length; the eyes are wine red.

POROCORIXA HIRTIFRONS sp. nov.

♂ Head ochraceous, distinctly longer than its width at base between eyes, slightly shorter than the pronotum; a little produced in front of eyes; posterior

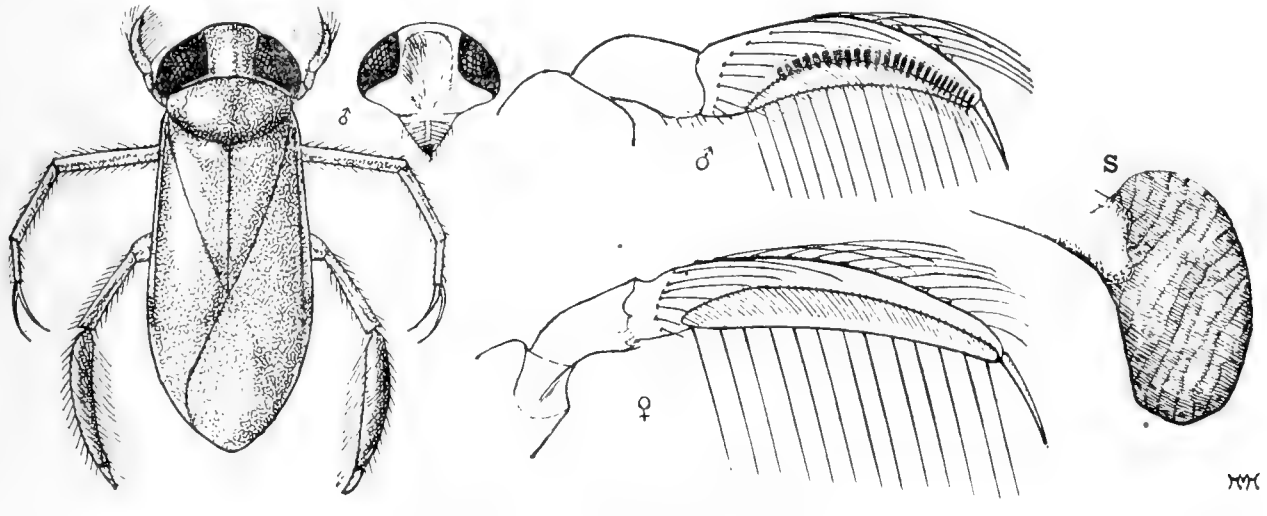


Fig. 345. *Porocorixa hirtifrons*.

margin medianly angular; a longitudinal, interocular carina, dilated anteriorly, with an indistinct line of punctures on each side and another bordering the inner margin of each eye, curved inwards above an indentation next to each posterior angle; face densely covered with long, yellow hairs; impression very large and deep, broadly obovate, extending practically to the vertex and laterally almost touching the inner margins of the eyes; eyes directed moderately backwards, projecting beyond the anterior pronotal angles; inner margins diverging above, parallel on the face. Pronotum ochraceous, posteriorly narrowly margined with castaneous, clothed with a distinct, golden pubescence; about twice as broad between humeral angles as medial length, narrower than the head; punctures small, confluent, presenting an appearance of impressed, irregular lines; an obsolete median carina; anterior margin rounded, very slightly medianly incised; posterior margin evenly rounded; lateral margins moderately short, a little oblique; angles roundly obtuse. Hemelytra pale ochraceous, clothed with golden hairs; punctures dark, small and more or less confluent; inner margin of clavus paler; claval suture and outer edge of corium narrowly margined with castaneous; embolium whitish. Underside and legs stramineous; connexivum yellow; strigil(s) dark brown, very large, nearly 0·5 mm. in length; suboval, with about twelve rather irregular rows of striae; anterior tibiae stout, less than half as long as the palae, which are long, narrowly falcate, widest near the base; claw long and strong; twenty-five stridulatory pegs in a single row placed near, and following the curve of, the lower margin, not extending to the base; pegs regularly decreasing in length backwards, anteriorly triangular, pointed, thinner than, and about twice as long as, the posterior ones, which are stout suboval and pointed; intermediate tarsi a little more than half as long as tibiae, about as long as claws; posterior tarsi wide, longer than tibiae; swimming hairs brown. Length, 8 mm.

♀ Head a little shorter and wider; face slightly convex, densely clothed with golden hairs, punctured. Posterior margin of pronotum more widely edged with castaneous. Palae longer, narrower, and less curved. Length, 8 mm.

Hab. South Australia (Rev. A. P. Burgess); Central Australia: Cooper Creek (type locality, J. G. Reuter); Queensland: Cunnamulla (H. Hardcastle). Type, I. 15186.

The almost elliptical pronotum is furnished with longer and paler hairs, and the strigil is very much larger, than in either of the two preceding species. A more elongate form and lighter colouration, the large, densely clothed facial impression and the palae afford further distinguishing characters.

In the single imperfect example from Queensland the pronotum is light olivaceous in colour.

MICRONECTA Kirkaldy.

Micronecta Kirk., Entomologist, 1897, p. 260.

Sigara Fabr., Ent. Syst., iv, 1794, p. 59 (part), and Syst. Rhyng., 1803, p. 104 (part).

Type, *M. minutissima* Linnaeus.

The members of this cosmopolitan genus are all of small size; none is over 5 mm. in length, most are considerably smaller. The antennae are three-jointed (fig. 346a), the face is convex in both sexes, and the asymmetry is to the right in the male. Three species have been recorded from Australia by Kirkaldy, but these have not been recognized amongst the material now dealt with. As I have not had opportunity of examining the types, the author's descriptions are quoted verbatim. In this, or indeed any other group of small insects in which specific differences are comparatively slight, it is advisable, if not absolutely necessary, that descriptions should be accompanied by figures.

MICRONECTA BATILLA sp. nov.

♂ Head pale ochraceous, with a large, sub-circular marking (of darker colour anteriorly) which almost touches the eyes and reaches just beyond the vertex; a dark orange median, longitudinal line; posterior margin darkly suffused and with a black, central tubercle; long, prominent, much produced in front of eyes, about one and one-half times as long as the pronotum, its length greater than width at base between eyes, the inner margins of which are divergent, the interocular width anteriorly being greater than the length of the head. Pronotum pale olive green, with a faint, smoky-brown, horizontal fascia, which is interrupted in the middle and does not reach the lateral edges; almost elliptical, short, three and one-half times as broad between humeral angles as medial length; rather rugose, with irregular, transverse, punctured striae; lateral margins extremely short. Scutellum pale olive green, transversely wrinkled. Hemelytra of like colour, apically pitchy, basally paler; densely punctured, costal margins pale

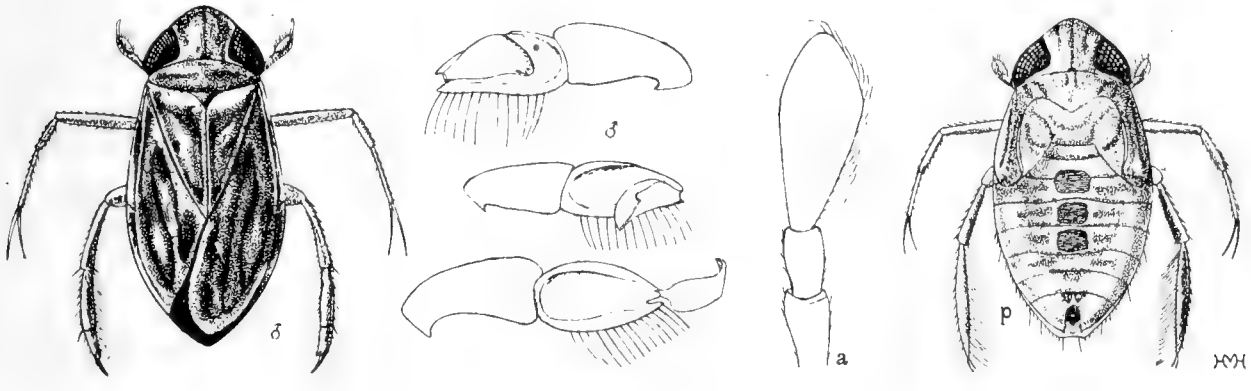


Fig. 346. *Micronecta batilla*.

with two dark streaks; clavus with pitchy, fasciate lines, sub-marginal to the edges, widened and darkened basally, and in a lesser degree medianly and apically; claval suture black; corium with four somewhat interrupted, blackish lines of varying thickness, lateral margin anteriorly pale ochraceous; apex of membrane roundly angulate. Sternum ochraceous; underside of abdomen pitchy, in parts ochraceous; legs pale ochraceous, in parts infuscated with orange; intermediate claws a little shorter than tarsi, which are darker at the tips. Length, 2·75 mm. to 4·5 mm.

♀ A little more robust. Underside pale ochraceous. Length, 3 mm. to 5 mm.

Hab. South Australia: Adelaide (H. M. Hale), Mount Lofty Ranges (type locality, H. M. Hale, Driffield, J. Formby, and Dr. L. Richter), Myponga (R. F. Kemp), Goolwa (A. Zietz), Yacka (A. H. Elston); Queensland: Gladstone (A. M. Lea); New South Wales: Coolabah (W. W. Froggatt), Hay (A. M. Lea); Victoria: Melbourne (Searle), Lake Hattah (J. E. Dixon). Type, I. 15187.

This species is variable in colour and in size, but in a series of specimens from any one locality these characters are fairly constant. The pronotum is sometimes smooth, and may be unicolorous or with faint indications of a transverse fascia; sometimes it is piceous, with the anterior and posterior edges and a longitudinal, median line of light colour; in a few examples the posterior margin only is pale. The base of the hemelytra is not always paler. Specimens from the Adelaide plains are dark olivaceous-brown, with the orange marking on the head indistinct. A single male from Queensland is fuscous with castaneous markings. Another colour variety is castaneous above, with the hemelytral markings extremely faint or absent, and the sutures and outer margin of the clavus narrowly edged with castaneous.

In the figures of the male palae, the large flattened claw is shown in various positions: this claw is hinged in a nick at the apex of the tarsus, and when folded back rests in a depression on the upper side of the joint.

Life colours. In parts the colours of a freshly-killed specimen rapidly alter as the insect dries; the life colouration of Adelaide specimens is as follows:

♂ Head pale, with a large, brownish-orange, sub-circular marking, within which are two U-shaped, bluish-green markings; blackly suffused at base; face cyaneous, paler centrally; eyes black. Pronotum, scutellum and hemelytra as previously described. Sternum pale, in parts greenish; xyphus green; underside of abdomen pitchy, paler posteriorly and on lateral edges; legs testaceous, in parts diaphanous; posterior half of intermediate femora sometimes pale blue.

♀ Underside of abdomen bluish-green.

The male is easily distinguishable by the pitchy abdomen.

In autumn (April and May) of 1921 this species was common in the Torrens River at Adelaide, at which time the water was at a comparatively low level; larvae and pupae (p), as well as imagos, were present in considerable numbers. In August of the same year, when the river had again somewhat subsided after the winter rains, hundreds of specimens were taken, all being fully adult. Mud adhered plentifully to the backs of very many of them, and in one instance a branched alga was attached to and growing profusely on the wing covers of the living bug. Epiphytic diatoms were associated with the alga, which was determined by Mr. L. J. Millar as a species of *Cladophora*, which has also been taken from the carapaces of Murray River tortoises. The presence of mud and living vegetation indicates that the insects are dormant during the winter. J. W. Douglas(7) observed English *Corixae* in the spring besmeared with mud, and suggests that the bugs are buried in the river-bed throughout the winter months. If, however, they merely remained inactive and clinging to weeds and stones, they would become similarly coated, for sediment would deposit evenly on the head, pronotum, and hemelytra.

MICRONECTA ROBUSTA sp. nov.

♂ Head greenish ochraceous, with a longitudinal, median testaceous line; hinder margin darkened and with a central, dark brown tubercle; length little more than half the width at base between eyes, rather shorter than the pronotum. Pronotum dark greyish-brown; width between humeral angles much more than twice medial length; shining, smooth, except for very faint transverse scratches; lateral margins a little oblique; angles obtuse. Scutellum testaceous. Hemelytra greyish-brown, paler at base, darkened apically; punctured; costal margins ochraceous, with two linear, blackish markings; clavus with somewhat broken

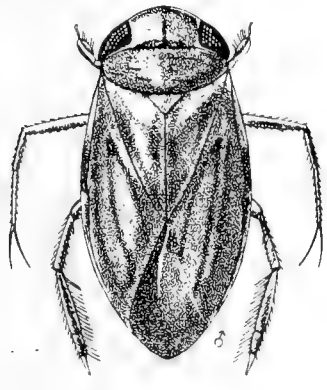


Fig. 347.
Micronecta robusta.

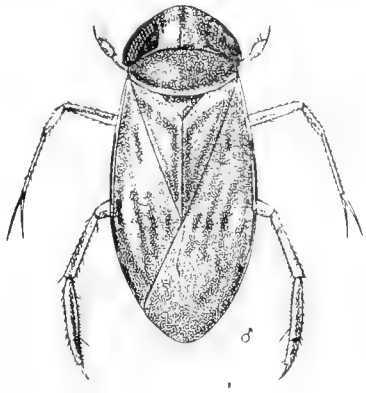


Fig. 348.
Micronecta gracilis.

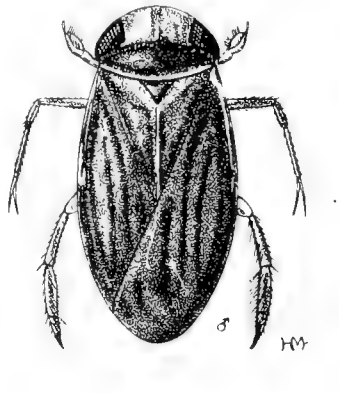


Fig. 349.
Micronecta virgata.

(7) Douglas, Ent. Month. Mag., iii, 1866, p. 27.

fasciate markings, parallel to margins; claval suture edged with ochraceous; corium with three or four more or less interrupted, dark, fasciate markings; outer edge ochraceous; apex of membrane roundly angulate. Sternum and legs ochraceous; underside of abdomen testaceous; intermediate claws as long as tarsi. Length, 3·75 mm. to 4 mm.

♀ Larger and more robust. Head rather shorter and wider; face centrally testaceous. Legs and underside wholly ochraceous or with posterior coxae darkened. Length, 4 mm.

Hab. South Australia: Adelaide (type locality, H. M. Hale), Quorn (A. H. Elston), Murray River (H. S. Cope and F. R. Zietz), Mount Lofty Ranges (J. Formby); Western Australia: Mullewa (Miss J. F. May); New South Wales: Coolabah (W. W. Froggatt). Type, I. 15188.

The head in drying sometimes assumes a more angularly rounded appearance in front of the eyes; the longitudinal, median line may be darkened and diffused. The pronotum may be unicolorous or posteriorly margined with ochraceous. A colour variety from Mylor, Mount Lofty Ranges, is pale ashen-grey, with brown markings.

MICRONECTA GRACILIS sp. nov.

♂ Head ochraceous, in parts darker; with a median, longitudinal, testaceous marking; posterior margin suffused with fuscous and with a small, central tubercle; rather long, well produced in front of eyes, about as long as the pronotum, almost as long as width at base between eyes, the inner margins of which are divergent. Pronotum dark castaneous, the posterior margin narrowly edged with paler; large, nearly twice as broad between humeral angles as medial length; shining, almost smooth, with very faint, transverse scratches; lateral margins short, oblique; angles sub-acute. Scutellum fuscous. Hemelytra pale fuscous, paler basally and on the costal edge; the last-named with three linear brown streaks; densely punctured; clavus with pale castaneous fasciate markings subparallel to the margins; corium with four obscure, broken, longitudinal, dark streaks. Underside ochraceous, in parts marked with fuscous; legs pale ochraceous. Length, 3·5 mm. to 4 mm.

♀ Underside ochraceous. Length, 3·5 mm. to 4 mm.

Hab. South Australia: Adelaide and Murray River (H. M. Hale), Quorn (type locality), and Myponga (A. H. Elston), Mount Painter, Flinders Ranges (H. G. Stokes); Queensland: Dalby (Mrs. F. H. Hobler); New South Wales: Tamworth (A. M. Lea); Victoria: Melbourne and Wattle Park, Balwyn (Searle), Coromby (J. G. O. Tepper). Type, I. 15189.

Differs from other species here described in the more slender form and comparatively long pronotum; the hemelytral markings are always broken; the pronotum is sometimes unicolorous.

Several examples from Cairns district, Queensland (A. M. Lea) are much smaller in size, all being less than 3 mm. in length; these possibly represent a local variety.

MICRONECTA ERATO Kirkaldy.

Micronecta erato Kirk., Ent. News (Philadelphia), xvi, 1905, p. 263.

"Head and underside pale stramineous. Pronotum pale sordid yellow, with a broad blackish brown median transverse stripe, which does not reach the lateral margins. Tegmina sordid stramineous; clavus with two dark brown narrow lines running parallel to interior and corial margins, uniting at the apex of clavus. Corium with two elongate, suboval areas narrowly dark brown bordered, and the exterior lateral margins also brownish black. Pronotum, scutellum, and tegmina somewhat superficially punctured. Head rounded in front, longer than the pronotum; lateral margins of pronotum obsolescent; membrane apically angulate. Length, about 3 mm. Australia: Victoria."

Type in author's collection.

MICRONECTA VIRGATA sp. nov.

♂ Head testaceous, posterior margin with a small, central, black tubercle; short and but little produced in front of eyes, about as long as the pronotum, its length a little more than half the width at base between eyes, which are very slightly divergent. Pronotum dark brown, posteriorly narrowly margined with ochraceous; shining, about three times as wide between humeral angles as medial length; anterior margin sinuate; lateral margins short; angles obtuse. Scutellum fuscous. Hemelytra testaceous, punctured, paler basally; costal margin with a linear black marking, interrupted in the middle; two distinct, pitchy-brown fasciate lines sub-marginal to the inner and outer edges of the clavus and four longitudinal ones on the corium; membrane with some dark spots. Underside and legs testaceous. Length, 3 mm. to 3·5 mm.

♀ Head, underside, and legs ochraceous. Length, 3·5 mm. to 4 mm.

Hab. Queensland: Townsville (type locality, G. F. Hill), Cairns district (A. M. Lea). Type, I. 15190.

The pronotum in some instances is not posteriorly margined with ochraceous.

MICRONECTA ANNAE Kirkaldy.

Micronecta annae Kirk., Ent. News (Philadelphia), xvi, 1905, p. 262.

"Head pallid. Pronotum dark fuscous brown, with darker transverse

median line. Tegmina fuscous brown (the margins of the areas narrowly darker), somewhat superficially punctured. Head a little longer than the pronotum, rounded in front. Pronotum elongate elliptical, lateral margins very short, much less than half the width of the posterior margin of an eye. Mesoxyphus acutely triangular. Terminal segment of antenna elongate, somewhat thickened. Intermediate femur equal in length to the tibiae, tarsus, and claw together; tarsus one-half longer than a claw, which is equal in length to the tibia. Subcostal furrow much as in *M. vanduzeei*. Length, 3¼ mm. Australia."

Type in author's collection.

MICRONECTA ANNAE Kirk., var. PALLIDA Kirk.

Micronecta annae Kirk., var. *pallida* Kirk., P.L.S., N.S. Wales, xxxii, 1908, p. 788.

"No transverse line on pronotum; tegmina with a pale castaneous basal band. Hab. Q.: Kuranda (Aug.; Perkins)."

The characters constituting the varietal diagnosis as given by the author are variable in some other of the species examined by me; the distinction of a "variety" on such foundation alone is somewhat doubtful.

MICRONECTA MICRA Kirkaldy.

Micronecta micra Kirk., P.L.S., N.S. Wales, xxxii, 1908, p. 788.

"Pale brown, brownish-testaceous beneath; a pale castaneous band at the base of the tegmina, lateral margins with one or two dark specks. Abdomen above partly dark. Head well rounded in front of eyes, which are practically contiguous with the corium. Pronotum very short, narrower than the head, *hind margin truncate*. Length, 2 mill. Hab. Q.: Kuranda (Aug.; Perkins)."

The main distinguishing feature of this small species appears to be the short, narrow, and posteriorly truncated pronotum.

DIAPREPOCORIS Kirkaldy.

Diaprepocoris Kirk., Ann. Mag. Nat. Hist. (6), xx, 1897, p. 52.

Type, *D. barycephala* Kirk.

This monotypic genus was founded upon female specimens. The palae, which are similar in both sexes, are "bisegmentate," the terminal joint having the form of a strong claw. Kirkaldy remarks that the "second segment appears to be a genuine second tarsal segment, not a single claw." The abdominal segments of the male are not disordered to the same extent as in other genera of Corixidae, and the asymmetry is not evident on the underside. The antennae are four-jointed (fig. 350a), and neither sex has a facial impression.

DIAPREPOCORIS BARYCEPHALA Kirkaldy.

Diaprepocoris barycephala Kirk., Ann. Mag. Nat. Hist. (6), xx, 1897, p. 53.

♂ Head flavous or ochraceous, a black dot often present on each side; prominent, produced in front of eyes and a little longer than its width at base between eyes; hinder margin almost evenly concave, dark testaceous centrally; face convex, with a broad, median carina; inner margins of eyes sometimes nearly parallel, sometimes considerably divergent. Pronotum testaceous or brownish-black, sometimes darkened posteriorly or anteriorly; laterally and where covered by head, pale; about four to six times as wide as long, finely rugose; anterior margin sinuate. Scutellum black, laterally testaceous; or flavescent, varyingly stained with testaceous or black; longer than wide, about as long as head and pronotum together Hemelytra sordid yellow, in parts infuscated; embolium wholly luteous or black on inner half. Scutellum and hemelytra clothed with short, black pubescence. Posterior dorsal segments of abdomen slightly asymmetric, with a comparatively large stridulatory apparatus to the right of the midline of the body (s); stridulator brownish-black, basally overlapped by the

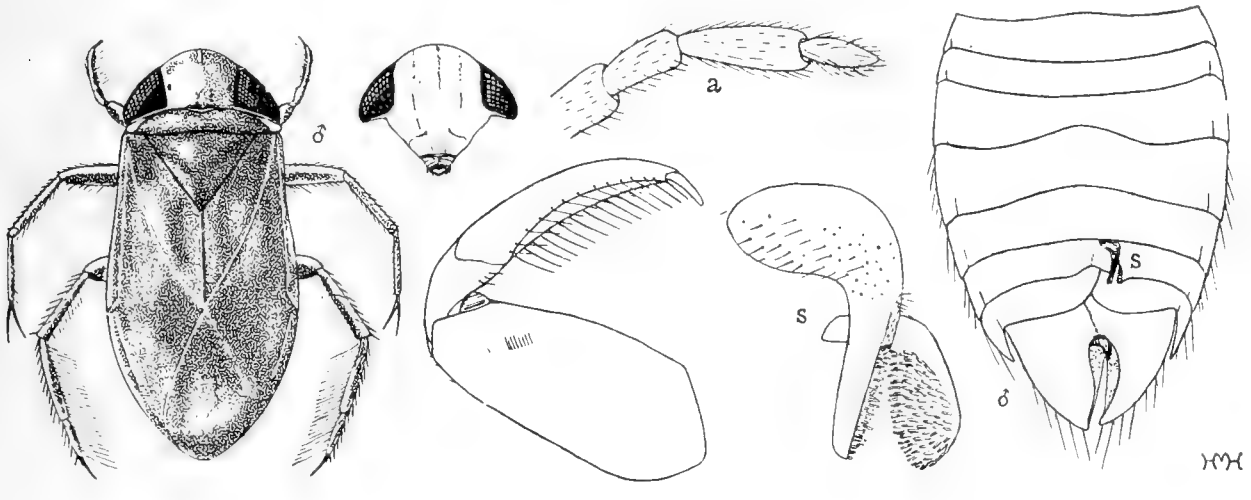


Fig. 350. *Diaprepocoris barycephala.*

fifth segment; stridulatory area black, situated on the sixth segment. Legs pale testaceous or flavous; palae sub-lunate, second joint very short, sub-cylindrical, slightly curved and tapering, rounded at the apex; anterior tibiae closely embracing base of palae; intermediate tibiae a little longer than tarsi; claws shorter. Length, 7 mm. to 7·5 mm.

♀ More robust than the male. Length, (6·2 mm.) to 8 mm.

Hab. South Australia: Adelaide (A. H. Elston and H. M. Hale), Lucindale (B. A. Feuerheerdt), Lake Alexandrina and Goolwa (A. Zietz), Murray Bridge (F. R. Zietz); "Victoria" and "Tasmania" (British Museum).

The colour is variable, some specimens being pale, while in others the infus-

cation is so marked that the insects appear almost uniformly dull black above; the wing-covers are semi-transparent, and the dark appearance is largely due to the nigrescent upper-surface of the abdomen, jet black in mature adults. Sometimes the whole underside, including the coxae, is black, only the face and other leg-joints being yellow.

There seems to be little doubt that the abdominal attachments referred to constitute a stridulatory apparatus. There are two hard, chitinous parts, a movable agent or stridulator, and a passive toothed area which is fixed to the sixth segment. The base of the stridulator is much expanded and flattened, forming a large lateral lobe. This is attached to the membrane beneath the fifth segment, which more or less covers the lobe, but is not connected with it. The free portion is almost straight, sub-cylindrical, and rounded apically; the right side is somewhat flattened and furnished with long, blunt, and slightly curved pegs, as is also the sub-circular stridulatory area immediately opposite; in the figure both surfaces are shown turned a little towards the observer.

It is not yet known whether these parts are operated while the insect is submerged or only when the wings are spread.

The smaller measurement of the female (6·2 mm.) is that given by Kirkaldy; the specimens examined by him may have included both sexes, but the male may not have been recognized, as the ventral segments of the abdomen differ but slightly.

An ABORIGINAL GIRDLE.

By EDGAR R. WAITE, F.L.S., C.M.Z.S., Director, S.A. Museum.

Plate v and Text fig. 351.

The native girdle is the property of Mr. Norman Napier Birks, and I am indebted to him for permission to describe it. It was obtained from "Northern Queensland," but further information is not available.

The girdle is 2590 mm. or 8½ ft. in length, and probably encircled the waist of a native three times. It is formed of the cocoons of a moth, strung on sinnet, 160 cocoons having been used. The cocoons are characteristic of those of a moth of the Family Bombycidae, and probably belong to a species of the genus *Pinara*; Mr. Arthur M. Lea, our Entomologist, says that in the absence of the moth it is not possible to more specifically identify the cocoon. As is usual with members of the genus, the cocoons were built on to small twigs; on tearing them off a scar has been left and, in some cases, a portion of the twig still adheres: in stringing the cocoons the native has been careful to so pierce them that the scar or twig faces sideways, the appearance from back or front of the girdle not therefore being marred.

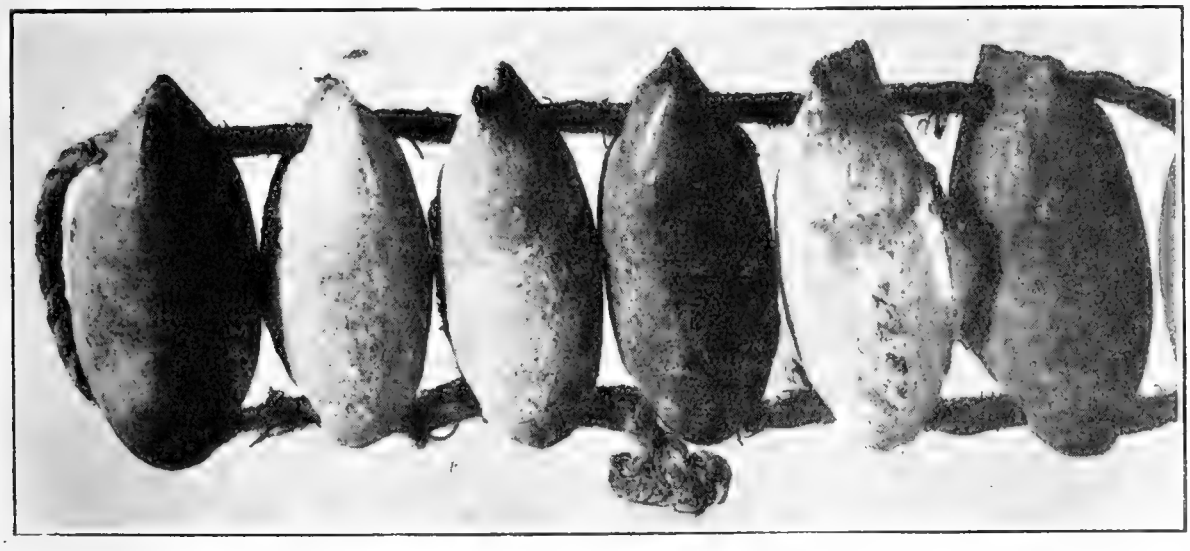


Fig. 351. Cocoons; natural size.

Each cocoon is about 40 mm. in length and 18 mm. in width; the open ends, or those from which the moth has emerged, have been squeezed, doubtless while the cocoon was fresh, and it is to be noticed that the squeezing has in all cases been done with the thumb or finger on the scar-bearing side; when strung, therefore, the flattened opening lies across the axis of the girdle.

The cocoons are pierced with two holes from the scarred side close to each end, the piercing having been done right through both walls. They are threaded on two-ply sinnet, which is returned through the last cocoon without joining. All the cocoons are strung facing the same direction, or, as we might say, right end up.

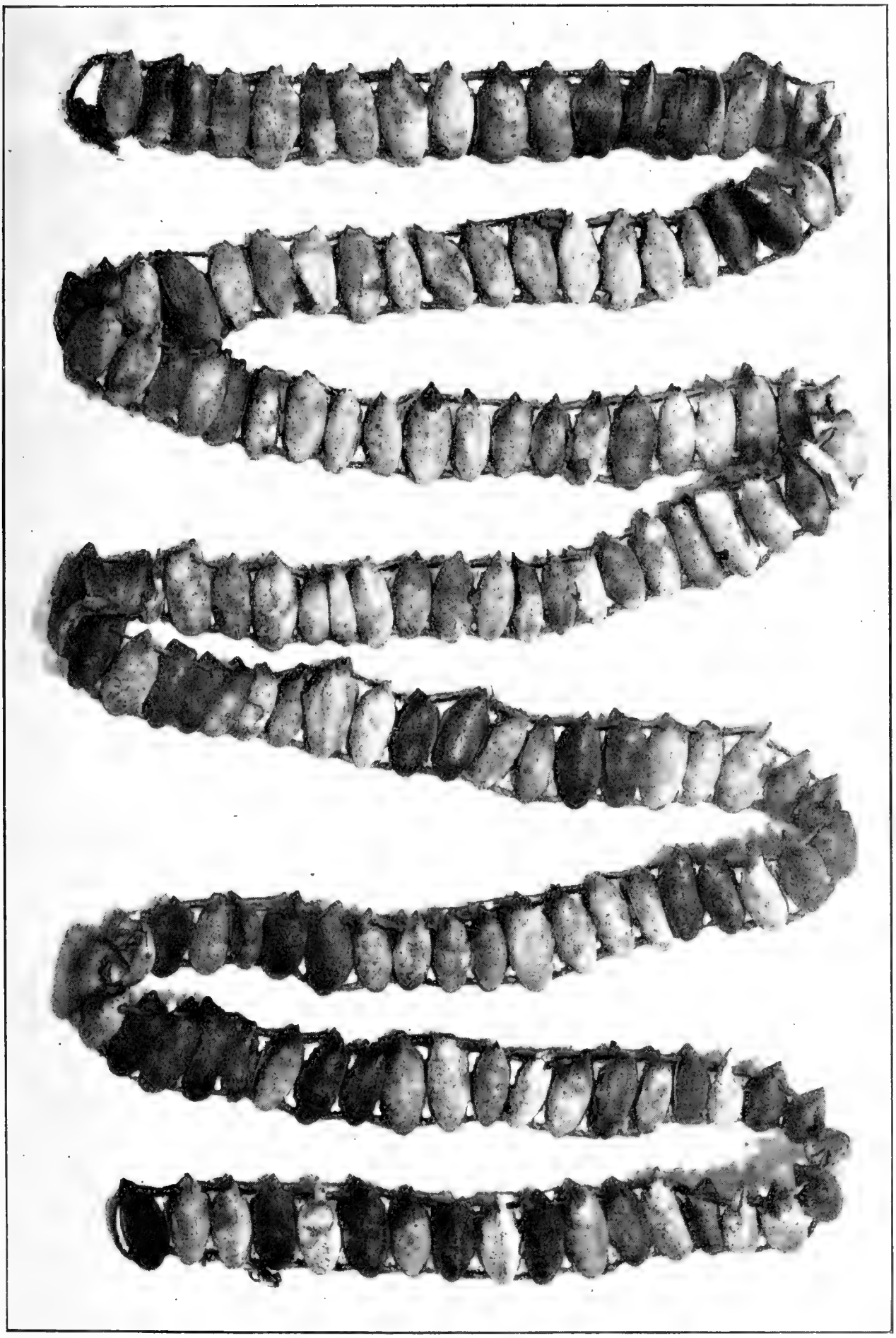
Each cocoon contains a half-thimble full of coarse gravel, and it is for the retention of this that the open ends have been squeezed and the lips kept in contact until the cocoons dried and hardened; how this was accomplished is not apparent or known.

When the girdle is shaken the gravel rattles within the dried cocoons, and there can be no doubt that it was worn in dancing.

Some of the cocoons are light grey in colour, others are brown, a distinction shown in the photograph (pl. v), which represents the entire girdle, the pinched ends of the cocoons being upwards. Fig. 351 shows the last six cocoons with the returning sinnet, the fifth last cocoon shows portion of the adherent twig.

Explanation of Plate v.

An aboriginal girdle from Northern Queensland, made of cocoons of a Bombycid moth.



AN ABORIGINAL GIRDLE

The MARSUPIAL GENUS THALACOMYS.

A Review of the Rabbit-Bandicoots; with the Description of a New Species.

By FREDERIC WOOD JONES, D.Sc., Hon. Curator in Anthropology.

Text figs. 352–360.

The rabbit bandicoots, rabbit rats, or native rabbits, constitute a very well-defined and extremely interesting little group of the syndactylous polyprotodonts.

At the present time it cannot be said that any species is at all common; but within the last twenty years certain of them have been quite abundant is suitable country, even in the immediate proximity of such towns as Adelaide. Both to the north and to the south of the city itself rabbit bandicoots lived in abundance but little more than twenty years ago, but to-day the animal is completely exterminated in practically all its old haunts. Pelts still come in small numbers to the skin salerooms, but formerly the beautifully silky skins were regular items in the markets of Adelaide.

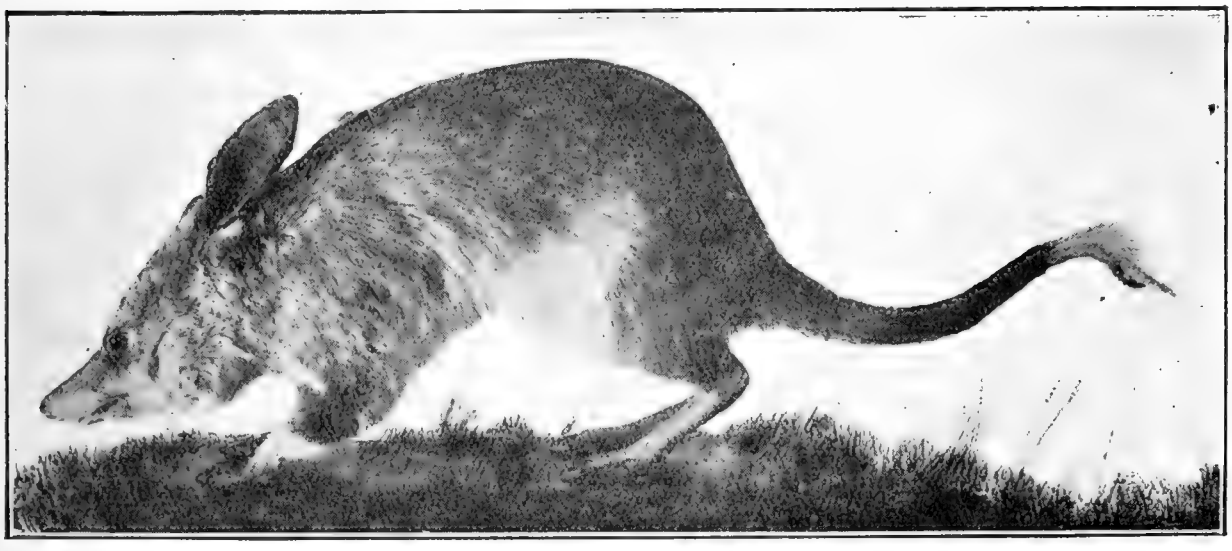


Fig. 352. *Thalacomys lagotis.* Male specimen from Nalpa, South Australia, in the South Australian Museum. About one-sixth natural size.

In South Australia the animals were usually known as "pinkies," or in some districts as "pintoes." It is said that the name "pinkie" was given to the members of the genus *Thalacomys* in allusion to the naked flesh-coloured snout; but the same name is also used to designate the Short-nosed Bandicoot *(Isoodon obesulus)* in certain parts of South Australia. In the Centre, rabbit bandicoots are usually known as "thulkas" or "talkies," which is the white man's rendering

of the name in general use among the Kukata blacks. Further into Western Australia the name changes to "dalgheites," "dalgites," or "dulgites." All these names are, however, somewhat local in their usage. The most general term, by which the animals seem to have been known to the colonists in all the States, is "bilby."

Unfortunately the rabbit bandicoots are not only rare animals to-day, but, as is the case with so many forms that were common enough only twenty years ago, the amount of preserved material existing in Australian Museums is sadly inadequate. To provide descriptions based on the examination of a thoroughly satisfactory series of skins and skulls would be a very difficult task for the worker in Australia. In the modern study of Mammalogy it is becoming increasingly important that the characters of a species should be determined from the examination of a large number of individuals, the provenence of which individuals should be precisely known. It cannot be said that the Australian Mammals, even the commonest species, are represented in sufficiently long series in Australian institutions to make work, in keeping with modern requirements, at all easy to carry out in Australia.

In some respects, therefore, this paper must be regarded as being merely tentative, for I am fully aware that the material I have been able to examine has been too limited in amount to make my conclusions as absolute as is desirable in studies of this kind. It is possible that the accumulation of further specimens may invalidate some of the deductions here put forward; for the variability of animals whose habitat is in the more central Australian regions is well recognized. The variability in adult size of animals living in the Centre is a very remarkable phenomenon, and some of the species of the genus *Thalacomys* have been established largely upon the size of the animal. It has therefore been my aim to sort out certain cranial features which serve to distinguish the known species, and so avoid so far as possible attaching importance to features which are well known to be unstable in the environment in which these animals live. In this way it is hoped that the necessarily small amount of material examined is compensated for, and meanwhile this paper may serve its purpose by providing a basis for future workers by gathering together the descriptions of all the known species within the compass of a single short article, and by providing figures of the main features of their cranial architecture.

In general, the bionomics of all the species may be taken as being similar, and in the following notes the individual species will not be differentiated unless it is known that their habits differ in some respects. Observations on wild specimens mostly relate to *T. sagitta*; whilst those observed in captivity have been *T. lagotis*, and the new species *T. nigripes*.

By the earlier colonists the bilby was not only regarded as an animal against which the methods of the exterminator need not be employed, it was even accorded a certain amount of protection and was, at times, kept as a pet about the house. The tolerance with which it was regarded by people whose hands may justly be said to have been against all animals was due to the fact that it

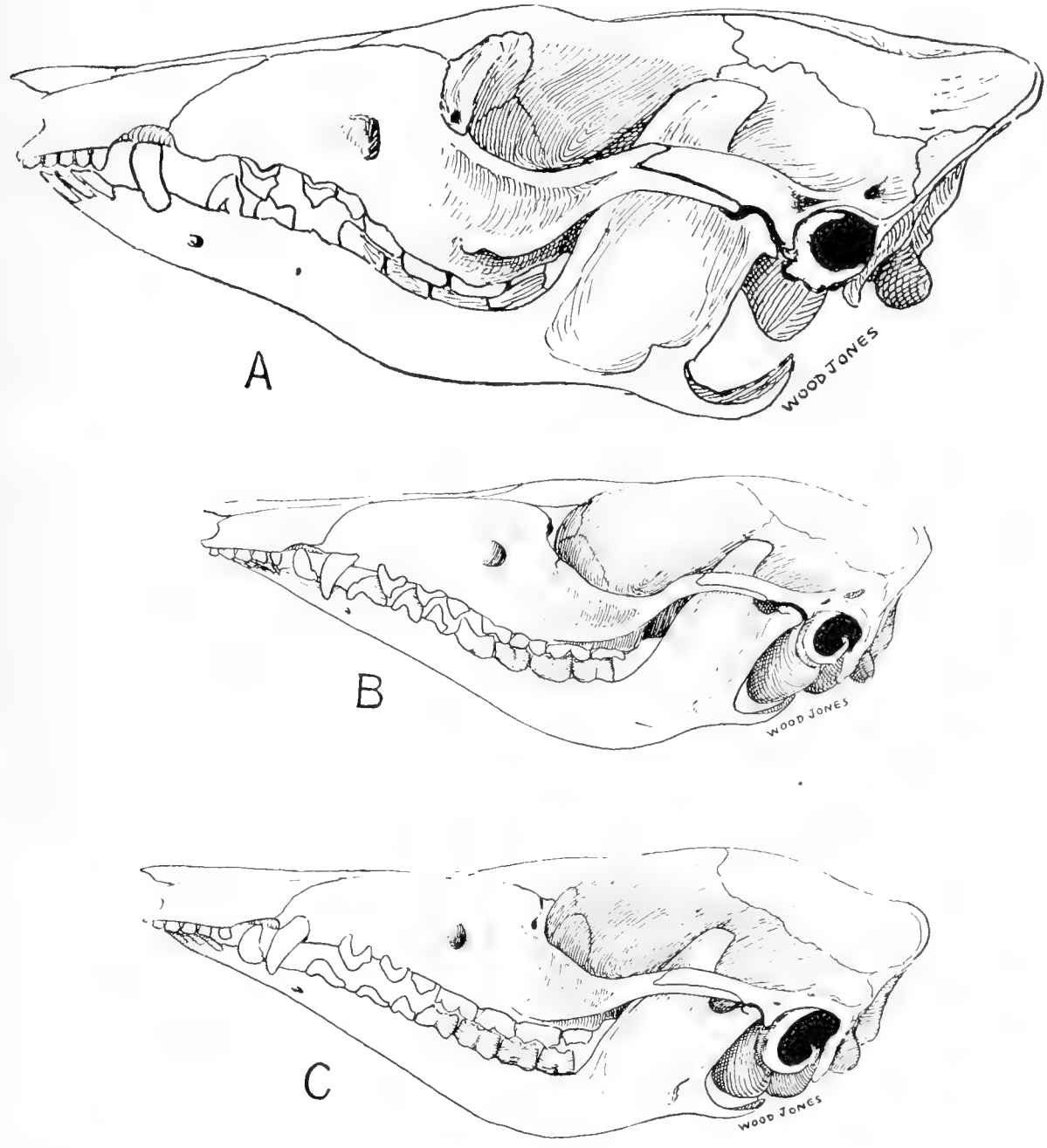


Fig. 353. Lateral views of skulls. (A) *T. lagotis*, from Nalpa. (B) *T. sagitta*, S.A. Mus., No. M1622. (C) *T. nigripes*, from Ooldea. All natural size.

was recognized early that, in the destruction of mice and insects, the rabbit bandicoots were extremely useful creatures. Unfortunately, this regard for the animals seems to have been forgotten by a later generation, and in more recent days but little mercy has been shown to them by any section of the community.

The diet of the bilby is commonly said to be "bulbous roots" (Krefft), "grass, fruits, and insects" (Lydekker), but I doubt very much if any of the species is at all given to eating roots, grass, or fruits. It is true that in districts where they live it is common to see little holes scratched around the roots of vegetation, but it is very doubtful if these are made in order to obtain roots. It seems much more likely that insects are the object of the search. In captivity I have been unable to persuade them to eat roots or fruit; but bread or cake, meat raw or cooked, insects, snails, birds, and mice are all readily eaten. Those that I have observed are far more carnivorous than any of the bandicoots *(Isoodon* or *Perameles)* that I have had living in captivity.

The members of the genus *Thalacomys* differ from the rest of the *Peramelidae* in their truly fossorial mode of life. *Isoodon* and *Perameles* will both scratch out shallow runways, but none of the species with which I am acquainted ever excavates real burrows in which to live. *Thalacomys,* on the other hand, passes most of its time in the depths of a burrow of its own making. These burrows are still to be seen in some numbers in certain districts to the north of the Trans-continental Railway from Port Augusta to Perth. The typical burrow, as it is excavated in this district, is easily identified, not only by the track of the animal and the characteristic mark made by its tail, but by the actual construction of the burrow itself. Unlike many burrowing animals, it does not make an exit and an entrance hole. The burrow has a single opening, and from the mouth it descends with a fairly steep but ever-opening spiral to a depth of five feet or more. The spiral construction seems to be universal, and the work involved in digging out a burrow is very considerable, for the animal by no means always selects those spots where the soil is loose, as Waterhouse affirms (p. 361). According to Sir Baldwin Spencer, *T. minor* differs from the other members of the genus in that "during the winter months it lies within a foot or so of the entrance of its burrow and only uses the inner chamber during the summer" (p. 9). *T. sagitta, T. nigripes,* and *T. lagotis* seem to occupy the furthest recess of the burrow at all times, and have to be dug out, whereas the blacks capture *T. minor* by stamping in the burrow behind it. Not only does *T. sagitta* spend the whole day at the bottom of its burrow, but in the region to the south and west of Lake Eyre, where alone I have field experience of it, it spends the whole of the cold weather, for it never comes abroad in the evenings of the short but sharp winter.

It is a feature not confined to the burrows of *Thalacomys,* for the homes of many creatures which live underground in the arid Centre show the same characteristic—that, though maybe a barrow load of earth must have been

removed in the excavation, the mound of débris at the entrance consists of no more than a bucketful.

By Krefft it is said not to be so ferocious as its large canines would lead one to suspect. To a certain extent that is true, and the animal can only be described as an extremely inoffensive creature. Nevertheless, all those with which I have had to deal have needed the exercise of considerable caution in their handling. They bite readily and savagely when interfered with, and though the bite may not be very severe, it is aggravated by the fact that the animal will not readily let go, and inflicts multiple bites from a single hold. Bilbies are strictly nocturnal, and come abroad at a later hour than any other marsupials that I have observed. Those that I have had living in captivity (in a large open-air run) have often been noticed to appear at dusk, but, after a hurried look round, to retreat to bed again, and not reappear for an hour or so. They seem, however, to have no objection to moonlight. During the daytime they sleep in a remarkable posture. No bilby that I have observed—even including one that had lost a hind leg in a rabbit trap—ever really lay down to sleep. The long ears are laid back, and then folded forwards against the side of the head, so that the tips come forward over the eyes, and alongside the snout. The animal then squats on its hind legs, and tucks its long snout between its fore legs, so making itself into a round silky ball, the tail being protruded straight behind it or flexed forwards right underneath the body. When the animal wakes in the evening it often starts its perambulation with one ear laid back and the other still doubled forwards in the sleeping position. It is curious that, though the ears are kinked flat upon themselves for the greater part of the time, there is no indication in them of a crease or folding line where the flexure takes place.

In any gait the hind limbs move together. In slow progression the fore limbs move alternately; in more rapid movements they move in unison, but alternately with the synchronously acting hind limbs. Waterhouse noted of one which lived in the gardens of the Zoological Society of London that, "when walking, the hind legs only were used, and these were very widely separated. The tail assisted slightly in supporting the body, which was but little raised in front" (p. 361). I cannot help thinking that this is an erroneous observation. It is quite true that the hind legs are widely separated, and that the body is but little raised in front; but I do not think that the animal ever progresses on its hind legs alone in true saltatory fashion.

It can make a good pace, though its progress always appears to be shuffling and somewhat ungainly. Its greatest safeguard is its aptitude for digging itself in, and the speed with which it can make for the shelter of its burrow.

In almost all published figures, and in most mounted specimens, the animal

is represented as standing far too high on its legs: such figures as Lydekker's Plate xx, and the mounted specimen photographed by Lucas and Le Souëf (fig. p. 137), give very incorrect postures for the animal. Compare figs. 352 and 358.

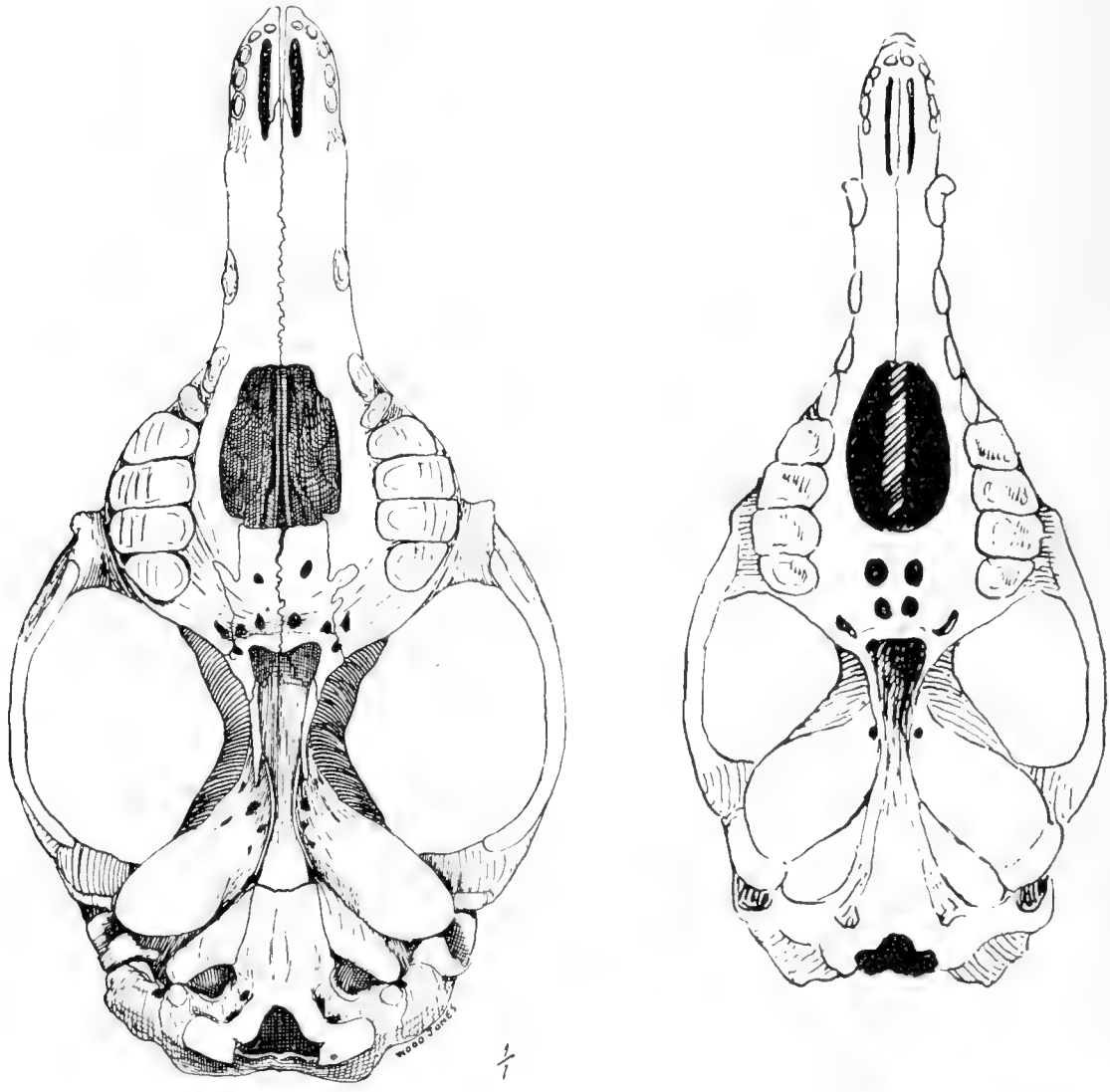


Fig. 354. Basal views of skulls of *T. lagotis*. Figure on the left from a male specimen from Nalpa, South Australia. Figure on the right from Thomas, Cat. Brit. Mus., 1888, pl. xxii, fig. 1. Natural size.

The toilet of the long silky hair is elaborate, and is performed, as usual, by the syndactylous pedal digits, the manus being unemployed. An animal which had suffered the loss of a hind leg made vigorous attempts to scratch itself with the short stump, but never attempted to replace the office of the absent member by the employment of its hands. The syndactylous digits, after being employed for combing, are invariably cleansed by the teeth and tongue. The change of pelage takes place twice a year, in September and in February, and is a prolonged affair. The new coat first appears upon the head, and slowly spreads over the shoulders and along the back. There is a very sharp line of division between the

old coat and the new, for the new hairs remain for a long while considerably shorter than the old, and they are distinctly more warmly coloured, the old coat appearing long and silvery, the new coat short and more fawn coloured.

The main guiding sense for food is olfactory, and, during daylight at least, the power of vision seems to be by no means acute. A grasshopper, even though it be actively moving, is detected in the daytime by scent before it is detected by sight. When active in the dark the auditory sense is evidently very keen, and although the animal will take no notice of a person who remains quite still, it will detect a footfall with remarkable discrimination.

The animal appears to produce no vocal sound save an inspiratory hiss when disturbed.

The reason for the rapid decrease in numbers of the bilbies is not obvious. Certainly they have been ruthlessly slaughtered in all districts within reach of the more settled areas. Their pelts have been marketed in large numbers for profit, and they have been more wantonly killed for "sport." Many have been maimed or killed in rabbit traps, and possibly many have fallen victims to poison baits. As with all the more defenceless marsupials, the introduced fox has probably played its sinister part. But in the Centre, where the fox is still absent or rare, it would seem that the extraordinary abundance of rabbits, and the consequent shortage of breeding burrows, has been a very real factor. It may be useless to plead for the preservation of the remnant of the bilbies, but at least it is worth urging that the sale of their pelts should be totally prohibited.

THALACOMYS Blyth.

Macrotis Reid, Proc. Zool. Soc., 1836, p. 131.

Thalacomys Blyth, Cuv. Anim. Kingd., 1840, p. 104; Thomas, Ann. Mag. Nat. Hist. (7), v, 1900, p. 223; Elliot. Publ. Field. Col. Mus. Zool., vii, p. 10, 1907.

Peragalia (Peragalea) Gray, 1843. By Thomas, Lydekker and Cabrera the reference is given as Grey's Australia, App. II, p. 401. Assuming this reference applies to Grey's "Travels in North-West and Western Australia," 1841, it is incorrect, as there the animal is listed as *Perameles lagotis*. By Cabrera the reference is also given for *Macrotis*, but no mention of this synonym occurs in this work. The reference should be Gray, Hist. Mamm. Brit. Mus., 1843, p. 96.

Type. *Macrotis lagotis* Reid.

The distinguishing characters of the genus may be summed up as follows: General form light and delicate. Pelage remarkably long and silky. Muzzle long and pointed, usually naked for a space upon its dorsal surface posterior to

the rhinarium. Rhinarium narrow; naked; grooved only slightly in its infranarial portion. Ears extremely long, naked, and membranous towards their extremities; funnel-shaped with a tubular base, processus antehelicis duplicated. Pouch opening downwards and slightly backwards. Nipples 8 (9 in the original description of Reid). Manus with 5 digits, the 1st and 5th short and clawless; the 2nd, 3rd, and 4th well developed and armed with strong curved claws. Hind limbs much longer than fore limbs. On the pes, the hallux is absent; the 2nd and 3rd digits syndactylous; the 4th and 5th well developed, the 4th being by far the largest. See fig. 360.

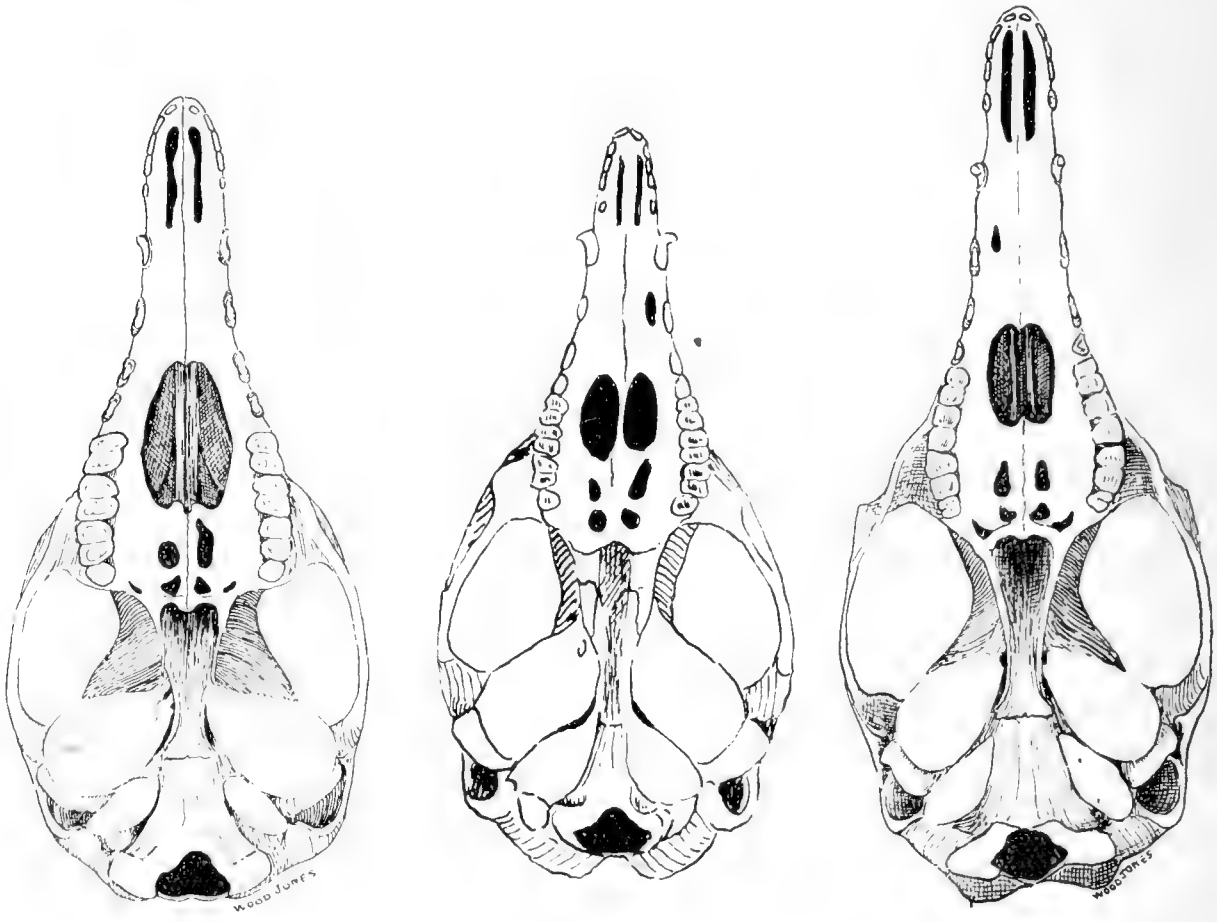


Fig. 355. Basal view of skulls. Figure on the left *T. sagitta*. Central figure *T. minor* (from Spencer). Figure on the right *T. nigripes*.

Digital formula of manus: 3 > 2 > 4 > 5 > 1; palm granular, three small interdigital tubercles at the bases of digits 2, 3, and 4.

Digital formula of pes: 4 > 5 > 2,3; sole hairy, with exception of heel, pad, and terminal portions of digits. One large pad at base of digit 4. Tail long, crested in its terminal portion.

Skull. Facial portion of skull abruptly contracted to snout region opposite the 2nd premolar. Palate large, the vacuities usually conjoined. Bullae very

large and pyriform; mastoid inflation well developed. Dentition: I $\frac{5}{3}$; C $\frac{1}{1}$; P.M. $\frac{3}{3}$; M $\frac{4}{4}$. Upper incisors broad and flat, I^5 being close to I^4. Canines large and powerful. The last premolar distinctly smaller than the tooth immediately in front of it. Molars square or rounded in section.

The genus appears to be obviously a specialized offshoot of the Australian bandicoots, which themselves find their more primitive representatives among the Papuan members of the genus *Peroryctes*.

THALACOMYS LAGOTIS Reid.

Perameles (Macrotis) lagotis Reid, P.Z.S., 1836, p. 129.

Peragale lagotis Thomas, Cat. Mars. & Mon. Brit. Mus., 1888, p. 223, pl. xxii, fig. 1; Flower & Lydek., Mamm., 1891, p. 143; Ogilby, Cat. Aust. Mamm., 1892, p. 24; Lydek, Mars. & Mon., 1894, p. 132; Spencer, Horn. Exp., ii, 1896, p. 17; Lucas & Le Souëf, Anim. of Aust., 1909, p. 137.

Thalacomys lagotis Elliot, Pub. Field Col. Mus., Zool., vii, 1907, p. 10; Cabrera, Gen. Mamm. Mon. & Mars., 1919, p. 82.

The external characters as originally recorded by Reid (Proc. Zool. Soc., 1836, p. 129) are as follows:

"*Perameles lagotis.* Per. griseus, capite, nucha, et dorso, castaneo lavatis; buccis, lateribus colli, scapulis, lateribus, femoribus extus, caudaque ad basin, palide castaneis; mento, gula, pectore, abdomine, extremitatibus intus anticeque, antibrachiis postice, pedibus que supra albidi, antibrachiis externe pallide griseus, femoribus extis posticeque saturate plumbeis; cauda, pilis longis albescentibus ad partem basalem, induta, dein pilis nigris tecta, parte apicali alba, pilis longis supra ornata. Vellere longo molli. Cauda pilis rudis vestita; pilis ad pedes brevissimus. Labio superiore, buccisque, mystacibus longis sparsis. Auriculis longis, ovatis, intus nudis, extus pilis brevissimis brunneis, ad marginem, albescentibus indutis, pilis ad bases eos plumbeis, apicalis albis aut castaneis, illis in abdomine omnio albis. Marsupio ventrali magno, mammis novem, in faciem posticum; quarum una centralis est, reliquis circumdata, intervalis acqualibus, gyrumque facientibus, transversum unciam cum quadrante reddentem."

The more extended descriptions that are given by Waterhouse and by Thomas are in practical agreement on most points, and the general specific characters of *T. lagotis* may be summed up as follows:

External Characters. Size large, head and body length being 400 mm. and upwards. General body colour fawn-grey, with ventral surface and inner aspect of limbs white. A faint indication of paler bands across the thigh is present in some specimens. Manus white. Pes white above; dark below in

the posterior half, or rather more. Tail with the black portion as long as, or longer than, the white portion.

Cranial Characters. Skull large; basal length 90 mm. or more. All muscular ridges and crests extremely well marked. The posterior (molar) portion of the palate distinctly rounded in outline; the molars arranged in crescentic series. The posterior end of the palate extending well behind the last molar teeth. The posterior palatine vacuities reach from about the central point of the middle premolar to about the central point of the third molar. The nasal bones extend backwards so that their posterior ends almost reach a line joining the lachrymal foramina. See figs. 353, 354, 356, and 357.

Dental Characters. Molars large. Intervals between the ligual margins of adjacent teeth very small. From the front of the canine to the back of M^4 is a distance of 42 mm. or more.

Distribution. The type specimen was described as coming from "Van Diemen's Land," but this was in error, the animal having been procured in the Swan River district of Western Australia.

The species still exists in Western Australia.

In South Australia, though it was formerly abundant in the southern portion of the State, it is now either extinct or on the verge of extinction.

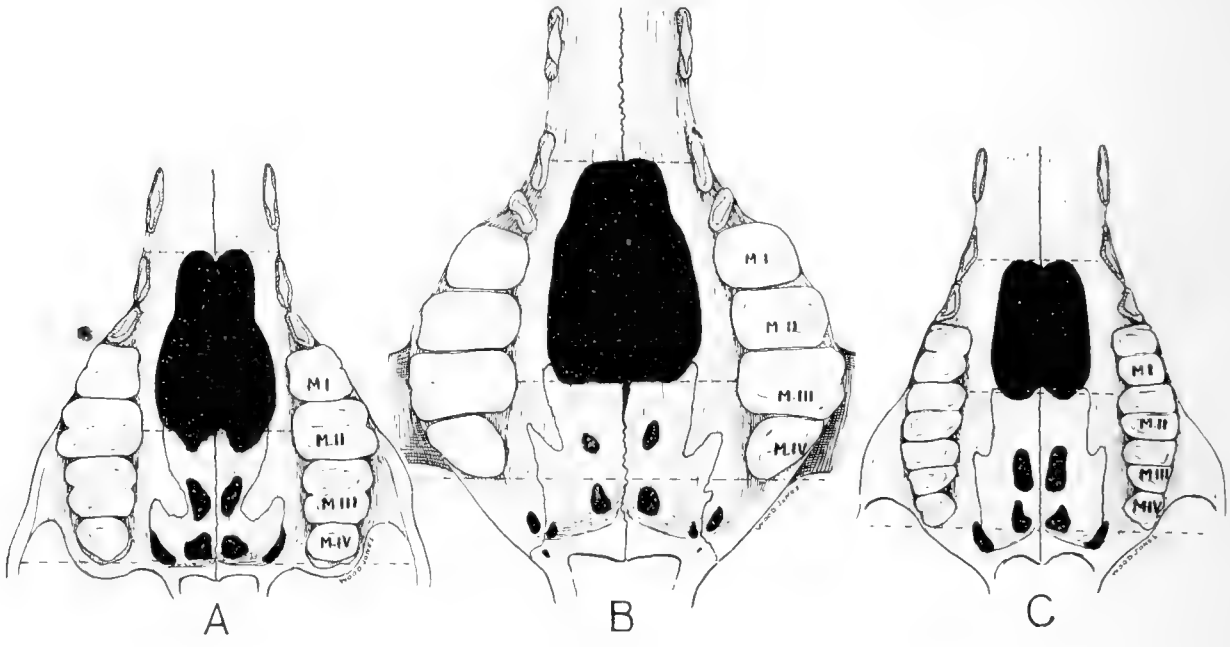


Fig. 356. The posterior portion of the palate in (A) *T. sagitta*, (B) *T. lagotis*, (C) *T. nigripes*.

Recently, owing to the kindness of Mr. Heber Longman, I have had the opportunity of examining a typical living specimen from Queensland.

It must not be imagined that *T. lagotis* is the representative of the genus in Western Australia, and that *T. sagitta* is the representative in South Australia, an impression which is rather easily gained from Thomas's 1905 paper; for

T. lagotis was the prevailing type in the southern portion of South Australia only a comparatively short time ago. Thirty years ago it was usual for rabbit trappers in the Southern districts to take more bilbies of this type than rabbits in their traps. Of this race, one very fine mounted specimen,* some half-dozen skulls, and a fully articulated skeleton are preserved in the South Australian Museum. The Museum material is mostly from Nalpa, and this for the reason that the country about Lake Alexandrina was the family property of the late Sir Edward Stirling (at one time Director of the Museum). From Nalpa the animal has long since disappeared. See fig. 352.

Dimensions in mm.

	Brit. Mus. ad. ♂ stuffed, W.A.	Reid. Type.	Waterhouse.	ad. ♂ stuffed. Nalpa, S.A.
Head and body	440	462	458	550
Tail	220	254	244	260
Hind foot	98	113	101	114
Fore foot	—	44	—	—
Ear	90	97	96	77
Rhinarium to eye	61	71	—	72

Dimensions of Skull.

	Nalpa.	Nalpa.	Nalpa.	Gilles Plains.	Western Aust.	Brit. Mus. W.A.	Brit. Mus. W.A.
Greatest length	114	114	110	105	104	—	—
Basal length	103	104	105	96	94	94	92
Zygomatic breadth	55	56	55	55	44	50	42
Nasals, length	50	48	47	49	47	47	46
Palate, length	64·5	66	66	64	62	61·5	61
C—M^4	45	44	43	43	45	44	42·5

THALACOMYS SAGITTA Oldfield Thomas, 1905.

Thalacomys sagitta Thos., Ann. Mag. Nat. Hist. (7), xvi, 1905, p. 426; Cabrera, Gen. Mamm., Mon. & Mars., 1919, p. 82.

In his paper of 1905 Mr. Oldfield Thomas decided, on the receipt of a specimen from Killalpaninna (wrongly spelled as Killalpanima), that the South Australian animal was so considerably smaller than the West Australian one that the two ought certainly to be separated. It may be pointed out that the district around the old mission station of Killalpaninna, which lies in the arid Lake Eyre basin of Cooper's Creek, can hardly be taken as a typical South

* A large specimen, but indifferently mounted, many years ago.—[Ed.]

Australian habitat. It is, therefore, not at all unlikely that the animal which was forwarded by Mr. Hillier does not represent the South Australian animal when we consider South Australia as a whole. The type *T. sagitta* should be regarded as a northern form, one which lives in the region of the Lake Eyre basin, probably from somewhere near Miller's Creek, in the S. and W. to Cooper's Creek in the N. and E., and Charlotte Waters in the N. *T. lagotis* is the form which had for its habitat the more watered and more fertile districts of the southern portion of South Australia. *T. sagitta* is the representative of the genus in the more arid central regions. Of the external characters, Oldfield Thomas says: "Externally, apart from the corresponding difference in size, there is little to distinguish the two forms. On the whole *T. sagitta* is a little paler in tone, the black band on the tail is slightly shorter, being shorter instead of longer than the white end, and the feet are paler below, the black only extending about a third of their length underneath the heel."

The general specific characters of *T. sagitta* may be summed up as follows:

External Characters. Size medium, head and body length being about 300 mm. and upwards. General body colour as in *T. lagotis*, but a little paler. Manus white. Pes white above; dark below in the posterior third only. Tail with the black portion shorter than the white portion.

Cranial Characters. Skull fairly large; basal length 70 mm. or more. Muscular crests not very well developed. The posterior (molar) portion of the palate only very slightly rounded in outline; the molars arranged in almost straight rows, which diverge posteriorly. The posterior end of the palate terminates at the last molar tooth. The posterior palatine vacuities reach from about the central point of the middle premolar to about the central point of the second molar. The nasal bones extend backwards so that their posterior ends come to within about 4 mm. of the line joining the lachrymal foramina. See figs. 353, 355, 356, and 357.

Dental Characters. Molars relatively large. But little space between the lingual margins of adjacent teeth. From the front of the canine to the back of M^4 is a distance of 36 mm., or slightly more.

Of *T. sagitta*, Oldfield Thomas reports that there are five skulls in the British Museum; a good example (No. M. 1622) is in the South Australian Museum, and I have some others, all obtained from the dessicated remains of animals long dead and often fragmentary, at Miller's Creek and at Coward Springs.

According to Mr. Hillier, the Diari name (Cooper's Creek) is "Kapita," and, as Oldfield Thomas points out, it is almost certainly the "Urgarta" of the Charlotte Waters blacks. It is also probably the "Thulka" of the Kukata.

Dimensions (measured in the flesh) by Mr. Hillier, who obtained the type specimen). Adult male:

Head and body	316 mm.	Hind foot	91 mm.
Tail	215 mm.	Ear	79 mm.

Dimensions of Skull.

	Type.	Coward, F. W. J.	S.A. Mus. No. 1622.
Greatest length	85	—	82
Basal length	76·5	—	74
Greatest breadth	38	35	35
Nasals, length	40	37	38
Palate, length	50	49	50
Front of C to back of M^4	36	36	37

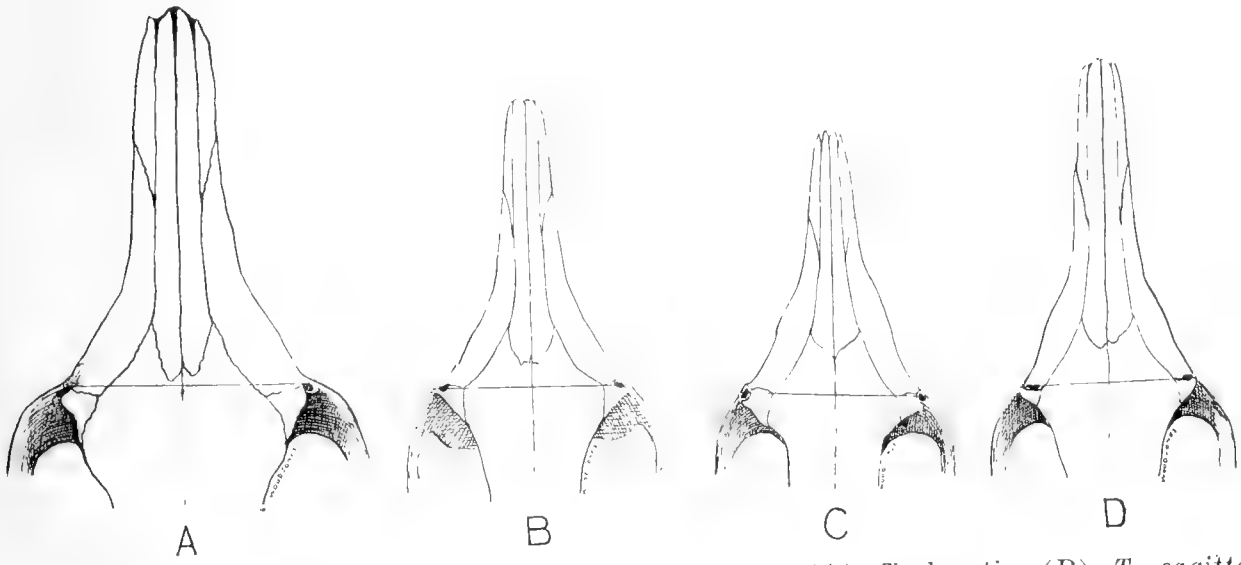


Fig. 357. The posterior extension of the nasal bones in (A) *T. lagotis*, (B) *T. sagitta*, (C) *T. minor*, (D) *T. nigripes*.

THALACOMYS MINOR Baldwin Spencer, 1897.

Peragale minor Spencer, Proc. Roy. Soc. Vict., ix, 1897 (New Ser.), p. 6, pl. ii, fig. 1-4.

Thalacomys minor Cabrera, Gen. Mamm., 1919, p. 82.

The description of the external characters of the type is as follows:

"Size considerably smaller than *T. lagotis*. Fur very long, soft and silky; composed almost entirely of under-fur. General colour fawn-grey, but darker than in *T. lagotis*. Head long, muzzle narrow. Rhinarium naked at the tip of the snout, but no backward prolongation of the naked part as in *T. lagotis*. Face grey-brown, the under-fur of the face grey basally, then fawn coloured with a dark tip, the longer hairs with a longer black tip. On the dorsal surface and sides of the body the under-fur is black basally, then fawn coloured. The longer

hairs very little longer than the under-fur, with a black tip. The hairs of the under-fur very often have a dark-brown tip. Chin and inner side of fore limbs white, the rest of the limbs and under-surface grey, the fur with a dark-grey basal part and white distal half. Hands white. Hind feet white above, hairy beneath, the hairs on the posterior two-thirds black, the anterior third white. Tail with the proximal two-thirds short haired. Along the dorsal line is a sharply marked narrow band of dark hair, increasing in length distally. At one-third of the length from the posterior end the black hairs stop abruptly, and are succeeded by a dorsal series of white hairs, forming a distinct crest, the hairs of which are proportionately shorter than in *T. lagotis*. Sides and under-surface of the tail with scanty stiff white hairs. Two small round pads at the base of the fourth and fifth toes. A few long whisker-like hairs on the posterior side of the fore limb, just above the wrist, the longest measuring about 40 mm. Mammae 8. Two or three young ones apparently produced at one time."

Of *T. minor* I have examined no specimen, and therefore rely wholly on Spencer's description. From this description the specific characters may be summarized as follows:

External Characters. Size small, head and body length being 200 mm. and upwards. General body colour as in *T. lagotis*, but somewhat darker. Manus white. Pes white above; dark in the posterior two-thirds below. Tail with the black portion longer than the white portion.

Cranial Characters. Skull small; basal length 60 mm. or more. Muscular crests and ridges very feebly marked, the skull being light and delicate in build. Posterior (molar) portion of the palate slightly rounded. Molars in slightly curved rows. The posterior end of the palate extends well behind the last molar tooth. Posterior palatine vacuities from about the central point of the middle premolar to the second molar (in figure) or to the third molar (in description). The nasal bones at their posterior ends fall short of the line joining the lachrymal foramina by about 5 mm. See figs. 355 and 357.

Dental Characters. Molars small. Considerable spaces between the lingual margins of adjacent teeth. From the point of the canine to the back of M^4 is a distance of 28 mm.

The type specimens came from the sandhills about forty miles to the north-east of Charlotte Waters, in Northern Territory. The native name is "Urpila."

Dimensions.

	Adult ♀	Adult ♀	Adult ♂	Adult ♀	Adult ♂
Head and body	215	200	245	240	270
Tail	124	118	127	152	160
Ear	71	68	87	85	92
Muzzle to eye	31·5	31	37	39	41

Dimensions of Skull.

	Adult ♂		
Greatest length	—	Nasals, length	32
Basal length	66	Palate, length	41
Zygomatic breadth	34	C^1—M^4	28

THALACOMYS NIGRIPES sp. nov.

The animal is almost the same size as *T. sagitta*, and therefore smaller than *T. lagotis* and larger than *T. minor*. In general colour it is much as *T. lagotis*, being darker and more fawn coloured immediately after the moult, and lighter and more silvery immediately before it. The general body colour becomes darker upon the dorsal surface towards the hind end of the body; the tips of the long hairs of the posterior end of the body being black. At the immediate base of the tail the dark hairs give way to rather bright fawn-coloured ones over a distance of about 30 mm. The naked rhinarium is flesh coloured, grooved upon its labial portion, and extending backwards dorsally for about 20 mm. Face fawn

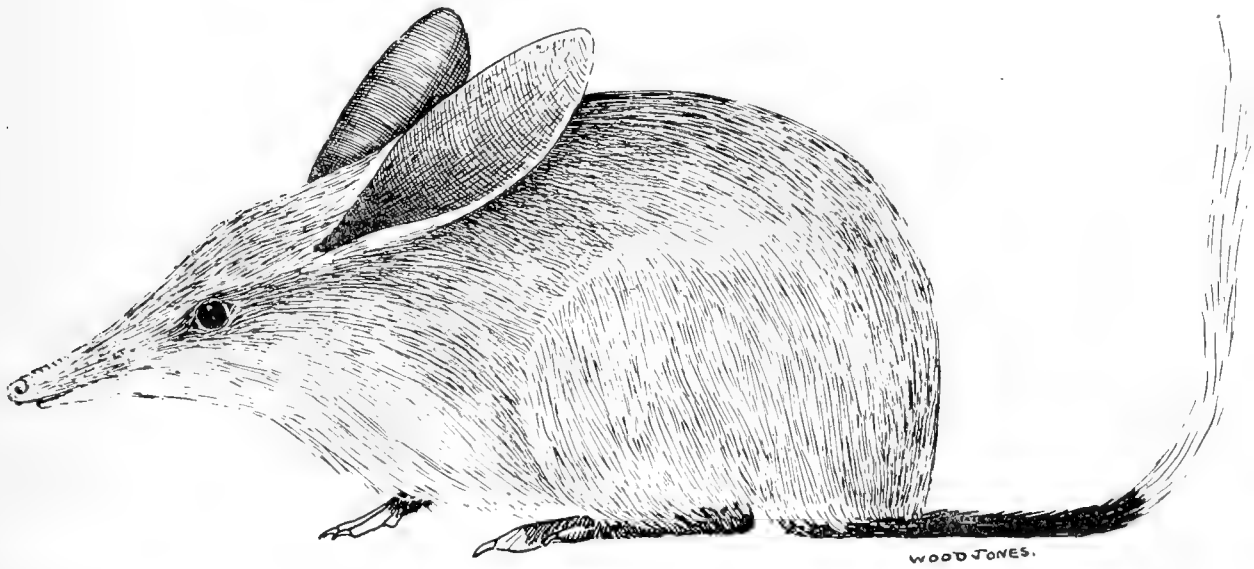


Fig. 358. *T. nigripes*. From a living male specimen. The terminal portion of the tail is represented erect merely for compactness in reproduction. About one-third natural size.

coloured. The dorsal surface of the snout, immediately behind the naked rhinarium, and as far back as the middle of the eye, is black. Fine black hairs also surround the eye. Sides of the body more fawn coloured than the dorsal surface. Chin, throat, and ventral surface pure white. The hair is directed uniformly backwards on the body, save that there is a reversed gular tract, as in the bandicoots. Fore limb dark as a whole upon its outer and dorsal aspects; white on the inner and ventral side. The proximal (humeral) portion dark grey, increasingly dark as it is traced downwards; the forearm, wrist, and dorsum of the

manus black. The black hairs stop abruptly over the metacarpus, the digits themselves being white. Just above the wrist the white of the inner aspect of the forearm trespasses on to the dorsal surface, making a prominent white patch, about 15 mm. in diameter, on the lower part of the forearm. The hind limb dark grey in the whole of its diameter in the tibial portion, save for a narrow strip of white on the dorsal (anterior) aspect. From the ankle onwards the pes is entirely black, both above and below, save for the presence of a few white hairs over a space of about 5 mm. at the base of the nail of the elongated 4th digit.

The base of the tail is fawn coloured, the basal area being succeeded by a portion, 75 mm. in length, clothed by coarse black hairs, followed by a terminal portion, 85 mm. long, clothed with long, coarse, white hairs; the terminal dorsal crest projecting another 40 mm.

A curious feature, which seems to have been overlooked in the description of other species, is that the tail ends in a prominent horny process.

Fig. 359. Tail of *T. nigripes*, to show the terminal spur.

The ears are enormously long, the auricle consisting of two distinct portions, a basal tubular portion clothed in the whole of its circumference with fawn-coloured hairs, like those of the head and face; this portion measures about 25 mm. along its anterior aspect. The terminal leaf-like portion is almost entirely naked, extremely thin, dark-grey in colour, and shining. In the living animal the blood vessels are conspicuous and, as in some of the bandicoots, the leaf-like portion of the auricle is punctate with little circular pits about 1 mm. in diameter. The naked portion of the ear is 90 mm. in length.

The eye is black. The mysticial vibrissae are arranged in five rows; the upper and longer bristles being black, the lower and shorter ones white. The longest measures 50 mm. There are two black supraorbital vibrissae; the one is long (45 mm.) and the other only about half that length. The genal set is represented by a tuft of six vibrissae, of which some are black and some are white; the longest measures 60 mm. The ulnar carpal set is well developed, and consists of three or more strong white bristles, of which the longest is 40 mm.

Details of the pouch and nipples not known, as so far no female specimen has been secured; presumably the condition is as in the other species.

The skull is, in its general characters, much as in *T. sagitta*, but from that form it is very readily distinguished in several details. The muscular ridges are

but little marked, the skull is lightly built, and the muzzle is extremely elongated and narrow. The posterior ends of the nasal bones are separated from the line joining the two lachrymal foramina by an interval of 5 mm. The palate is greatly elongated, and extends for a distance of 3 mm. behind the last molar tooth. The posterior portion of the palate is somewhat rounded, the molars being arranged in two slightly crescentic rows. The posterior palatine vacuities are peculiarly small, and they extend from the mid point of the middle premolar only to the anterior margin of the second molar. The small size of these vacuities constitutes a very striking and very constant distinction of the species. The teeth are small, the molars in particular being considerably smaller than those of *T. sagitta*. Considerable intervals exist between the adjacent lingual margins of the individual molars.

The general specific characters of *T. nigripes* may therefore be summed up as follows:

External Characters. Size fairly large, head and body length being 320 mm. and upwards. General colour much as in *T. lagotis*. Manus black above over the carpus and metacarpus, white over the digits. Pes black, both above and below, a few white hairs on the base of the ungual phalanx of the fourth digit in some specimens. Tail with the black portion shorter than the white portion.

Cranial Characters. Skull fairly large; basal length between 70 and 80 mm., or very slightly more. Muscular crests not well developed. The posterior (molar) portion of the palate slightly rounded in outline; the molars arranged in crescentic rows. The posterior end of the palate extends well behind the last molar tooth. The posterior palatine vacuities reach from about the central point of the middle premolar to the anterior edge of the second molar. The nasal bones extend backwards so that their posterior ends fall short of the line joining the two lachrymal foramina by an interval of about 5 mm. See figs. 353, 355, 356, and 357.

Dental Characters. The molars are small. Considerable intervals exist between the lingual margins of adjacent teeth. From the front of the canine to the back of M^4 is a distance of some 35 mm., or slightly more.

A spirit preserved male specimen is in the collection of the South Australian Museum, and I have examined five others, all males. All the specimens have come from a restricted area around Ooldea Soak, and I am indebted to Mr. A. G. Bolam for all the material that I have been able to examine. The Museum specimen was sent in by Mrs. Daisy M. Bates, and all the examples have been captured by the aboriginals around the Soak. It is very much to be hoped that further collecting will make it possible to examine a female specimen.

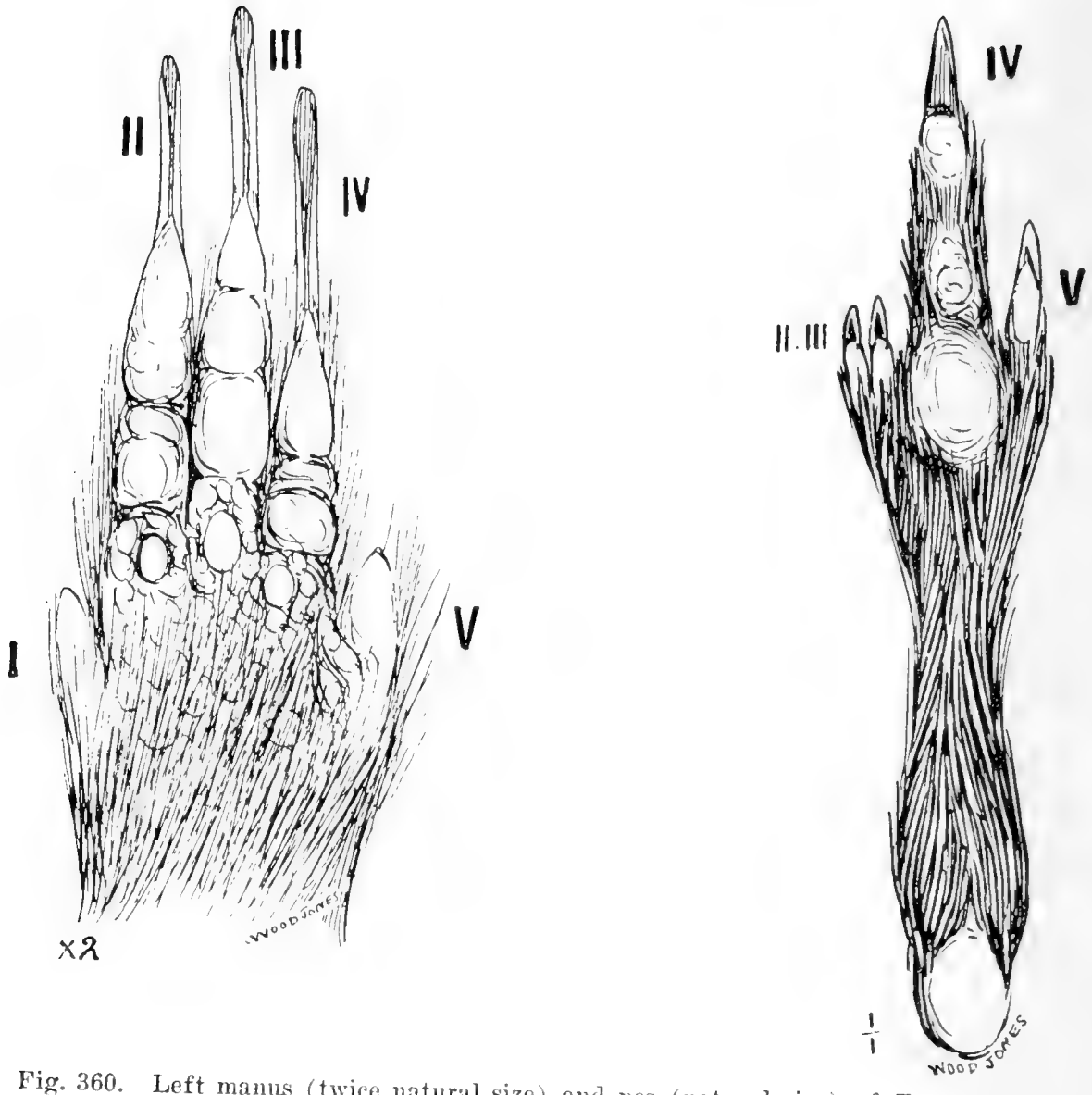


Fig. 360. Left manus (twice natural size) and pes (natural size) of *T. nigripes.*

Dimensions (in the flesh).

	Type ♂	Adult ♂ A.	Young adult ♂ B.
Head and body	390	365	320
Tail	200	220	210
Hind foot	98	96	92
Fore foot	29	29	29
Ear	105–90	110–97	103–90
Rhinarium to eye	57	54	57
Rhinarium to ear	126	125	125

Two measurements are given for the ear, the first being the dorsal and the second the ventral dimension.

Dimensions of Skull.

	Type ♂	Adult ♂ A.
Greatest length	86·5	80
Basal length	81	72·5
Greatest breadth	35	32
Nasals, length	40	33
„ breadth	8	7
Intertemporal	13	12
Palate, length	50	48
„ breadth, outside M^3	20	20
„ breadth, inside M^3	12	12
Palatine foramen	10	10
C—M^4	37	34·5
M^1—M^3	13	12

THALACOMYS LEUCURUS Oldfield Thomas, 1887.

Peragale leucura Thos., Ann. Mag. Nat. Hist. (5), xix, 1887, p. 397, and Cat. Mars. & Mon. Brit. Mus., 1888, p. 225; Lydek., Mars. & Mon., 1894, p. 134; Ogilby, Cat. Aust. Mamm., 1892, p. 23.

Thalacomys leucurus Cabrera, Gen. Mamm. Mon. & Mars., 1919, p. 82.

The full description of this species being in a standard work, the specific characters will be given here only in summary.

External Characters. Size small, head and body length of type specimen (young animal) being 142 mm. General body colour uniform pale yellowish fawn. Manus white. Pes white. Tail white.

Cranial Characters. Skull small and delicate; basal length 45 mm.

Dental Characters. Molars small.

The type specimen, a very young male, was sent by Mr. Beazley, who was at that time employed as taxidermist to the South Australian Museum, to Oldfield Thomas. The precise locality from which the specimen came is not known, and the example, so far as I can ascertain, remains unique.

Nevertheless I have definite information that a fawn-coloured rabbit bandicoot was well known to men who were in Western Australia in the comparatively early gold mining days. Sir Baldwin Spencer, who has made repeated efforts to procure further specimens, has hitherto failed to come across any trace of it. Possibly it may yet be found in the vast region of the western portion of the Centre.

Summary.

The individual characters as they are present in the different members of the genus may be tabulated as follows:

(1) Length of head and body, 440–550 mm., *T. lagotis.*
" " " 320–390 mm., *T. nigripes.*
" " " 316 mm., *T. sagitta.*
" " " 200–270 mm., *T. minor.*
" " " 142 mm., *T. leucurus.*

(2) Manus. White in *T. lagotis, sagitta, minor,* and *leucurus.*
" Black over carpus and metacarpus, white over digits, *T. nigripes.*

(3) Pes. White above and below, *T. leucurus.*
" White above; posterior $\frac{1}{3}$ black below, *T. sagitta.*
" White above; posterior $\frac{1}{2}$ or more black below, *T. lagotis.*
" White above; posterior $\frac{2}{3}$ black below, *T. minor.*
" Black above and below, *T. nigripes.*

(4) Tail. Black portion as long as, or longer than, white portion, *T. lagotis, T. minor.*
" Black portion shorter than white portion, *T. sagitta, T. nigripes.*
" White throughout, *T. leucurus.*

(5) Skull. Basal length, 92–105 mm., *T. lagotis.*
" " " 80–81 mm., *T. nigripes.*
" " " 74–76·5 mm., *T. sagitta.*
" " " 66 mm., *T. minor.*
" " " 45 mm., *T. leucurus.*

(6) Palate. Extending some distance behind M^1; distinctly rounded in its posterior portion, *T. lagotis.*
" Extending some distance behind M^1; only slightly rounded in its posterior portion, *T. nigripes, T. minor.*
" Terminating at M^1; scarcely rounded in its posterior portion, *T. sagitta.*

(7) Posterior palatine vacuities from mid-point of middle premolar to mid-point of M^3, *T. lagotis.*
" To mid-point of M^2, *T. sagitta, T. minor.*
" To anterior border of M^2, *T. nigripes.*

(8) Nasals. Extending back almost to the line joining the two lachrymal foramina, *T. lagotis.*
" Falling short of such a line by an interval of some 4–5 mm., *T. nigripes, T. sagitta, T. minor.*

(9) Distance from front of canine to back of M^1, 42·5–45 mm., *T. lagotis.*
" " " 36–37 mm., *T. sagitta.*
" " " 34·5–37 mm., *T. nigripes.*
" " " 28 mm., *T. minor.*

AUSTRALIAN DUNG BEETLES OF THE SUB-FAMILY COPRIDES

By ARTHUR M. LEA, F.E.S., ENTOMOLOGIST, S.A. MUSEUM

Plates vi–ix.

IN comparison with other parts of the world Australia has but few Coprides, mostly below the average size of those occurring elsewhere; the largest species, *Aulacopris reichei*, seldom reaching a body-length of an inch and a quarter. This, however, is only to be expected considering the dearth of large indigenous mammals. Dung beetles of several kinds have multiplied with the distribution of the cow and horse, and many European species have been introduced, especially in the Aphodiides and Staphylinidae.

Some of our genera are of exceptional interest, such as *Macropocopris*, species of which live in the fur about the anal region of marsupials, and have developed extremely powerful claws; one species, *M. symbioticus*, has been found in the cloaca of a wallaby. Dr. J. F. Illingworth informed me that *Pedaria geminata* habitually uses, for its own young, dung-balls formed by other species of Coprides.

The following is a list of the species previously recorded as occurring in Australia, synonyms being printed in italics:

Actinophorus leei Shipp.
Aulacopris reichei White.
Canthonosoma castelnaui Har. *(Cephalodesmius).*
macleayi Har. *(Cephalodesmius).*
mastersi Macl.
Homodesmius haroldi Sharp.
planus Sharp *(Homodesmius).*
Catharsius australiae Shipp.
tricornutus Felsche.
Cephalodesmius armiger Westw.
cornutus Macl.
laticollis Pasc.
minor Blackb.
quadridens Macl.
Copraecus hemisphaericus Guer.
Coptodactyla baileyi Blackb.
acuticeps Felsche.
ducalis Blackb.
glabricollis Hope.
monstrosa Felsche.
subaenea Har.
Epilissus globulus Macl.
niger Lansb.
ustulatus Lansb.
Labroma horrens Sharp.
Menthophilus tuberculatus Waterh.
Macropocopris carmodensis Blackb. *(Onthophagus).*
kingi Har *(Onthophagus).*
O. muticus Macl.

parvus Blanch *(Onthophagus).*
O. inermis Macl.
O. submuticus Blackb.
prehensilis Arrow.
symbioticus Arrow.
Minthophilus carinatus Reiche.
hollandiae Boi.
subsulcatus Sharp.
Monoplistes haroldi Lansb.
Onthophagus acuticeps Macl.
adelaidae Hope.
hostilis Har.
anisocerus Er.
cupreoviridis Blanch.
fuliginosus Er.
asper Macl.
patruelis Har.
atrox Har.
quinquetuberculatus Macl.
palmerstoni Blackb.
pugnacior Blackb.
sloanei Blackb.
aureoviridanus Blackb.
auritus Er.
cereus Hope.
micans Sturm.
umbraculatus H. & J.
australis Guer.
capella Boi (nec Kirby).
bicornis Macl.
bipustulatus Fabr.
blackburni Shipp.
nitidior Blackb.
blackwoodensis Blackb.
capella Kirby.
captiosus Har.
carteri Blackb.
comperei Blackb.
consentaneus Har.
granulatus Macl.
conspicuus Macl.
bovilli Blackb., var.
cowleyi Blackb.
crotchi Har.
cruciger Macl.
cuniculus Macl.
declivis Har.
desectus Macl., var.
devexus Macl.
discolor Hope.
dumbrelli Blackb.
dunningi Har.
emarginatus Macl.
erichsoni Hope.
evanidus Har.
fabricii Waterh.
ferox Har.
inaequalis Dej.
mniszechi Har.
fissiceps Macl.
fitzroyensis Blackb.
fletcheri Blackb.
frenchi Blackb.
furcaticeps Masters.
froggatti Macl.
furcatus Macl.
lobicollis Macl., var
geelongensis Blackb.
glabratus Hope.
granulatus Boh.
granum Lansb.
haagi Har.
helmsi Blackb.
henleyensis Blackb.
humator Shipp.
humeralis Macl.

howitti Blackb.
incanus Macl.
incornutus Macl.
integriceps Macl.
jubatus Har.
duboulayi Waterh.
koebelei Blackb.
laminatus Macl.
cowleyi Blackb.
pugnax Har.
latro Har.
leai Blackb.
lucidicollis Boh.
macleayi Blackb.
macrocephalus Kirby.
margaretensis Blackb.
mastersi Macl.
minusculus Macl.
murchisoni Blackb.
mutatus Har.
hirculus Er.
muticus Macl.
nanus Waterh.
negatorius Blackb.
nodulifer Har.
divaricatus Macl.
ocelliger Har.
parallelicornis Macl.
pentacanthus Har.
quadridentatus Hope.
perpilosus Macl.
pexatus Har.
picipennis Hope.
planicollis Har.
pontilis Blackb.
posticus Er.
flavolineatus Blanch.
promptus Har.
pronus Er.
propinquus Macl.
purpureicollis Macl.
quadripustulatus Fabr.
queenslandicus Blackb.
rubescens Macl.
rubicundulus Macl.
rubrimaculatus Macl.
decurio Lansb.
ruficapra Waterh.
rufosignatus Macl.
rogusus Kirby.
salebrosus Macl.
schmeltzi Har.
subocelliger Blackb.
sydneyensis Blackb.
tabellicornis Macl.
tamworthi Blackb.
thoreyi Har.
tweedensis Blackb.
victoriensis Blackb.
jungi Blackb.
vilis Har.
villosus Macl.
viridiobscurus Blanch.
walteri Macl.
zietzi Blackb.

Panelus bidentatus Wilson.
pygmaeus Macl. *(Temnoplectron).*
arthuri Blackb.

Pedaria geminata Macl. *(Aphodius).*

Platyphymatia aeneopicea Waterh.
calcarata Macl.
squalida Macl.
tuberculata Lansb.

Temnoplectron diversicolle Blackb.
laeve Waterh.
lucidum Macl.
occidentale Macl.

politulum Macl.
rotundum Westw.
tibiale Macl.
Tesserodon angulatus Westw.
gestroi Lansb.
hollandiae Fab.
novaehollandiae Boi.
piceus Hope.
variolosus Macl.
Thyregis kershawi Blackb.

CANTHONOSOMA MACLEAYI Har. (Cephalodesmius), 1868.

Canthonosoma mastersi Macl., 1871.
Homodesmius haroldi Sharp, 1873.

Plate vi, figs. 1, 2.

Macleay described the front legs of *Canthonosoma* as without tarsi, and this is the case with most of the specimens of *C. mastersi* before me, but this is certainly due to wear or accident, as on one co-type the right tarsus is present, on another both are present; the front tibiae often have the appearance as of being worn down, and the projection on each side of the median notch of the clypeus also diminishes in size with usage; on worn specimens the bronzy gloss disappears and most of the setae of the upper-surface. Two specimens before me are from Rockhampton, and agree with the description of *Homodesmius haroldi*, which I can only regard as a synonym; the species, however, was first described as *Cephalodesmius macleayi*.

CANTHONOSOMA CASTELNAUI Har. (Cephalodesmius).

Plate vi, figs. 3, 4.

Two females from Pine Mountain (Queensland) were labelled in the Simson collection as *Cephalodesmius castelnaui*, and apparently correctly so. Several males from Capella (Queensland) differ from them in having the sides (epipleurae) of the elytra so compressed that from above each elytron appears to be bounded by a strongly elevated and rather narrow ridge. The small shining tubercles on the prothorax are more conspicuous than on the female, and the metasternum has an obtuse tubercle in front.

CANTHONOSOMA PLANUM Sharp (Homodesmius).

This species[1] was not recorded in Masters' Catalogue, and evidently also belongs to *Canthonosoma*.

(1) Sharp, Rev. et Mag. Zool., 1873, p. 37.

COPRAECUS HEMISPHAERICUS Guer.

Plate vi, fig. 5.

I have not seen the original description of this species, but the figure given in Cuvier's Animal Kingdom(2) shows two spines on each of the middle and hind tibiae, although on figure 3a only one spine is shown; Reiche(3) described and figured the tibiae as unispinose, and his figure is considerably narrower than that of Westwood's.(4) The species is a very rare one, and no locality, other than "Australia," has been noted for it; but there are now before me three specimens varying in length from 13 to 16 mm., from East Kimberley and Broome. The species may be readily distinguished by the elytra; each of these has six, moderately elevated, shining interstices, with a row of setiferous punctures on each side (but the setae appear to be easily abraded); the middle tibiae are bispinose, the hind ones unispinose; on the male only there is a curved process at the apex of the hind tibiae.

The species is probably congeneric with *Canthonosoma macleayi,* from which the male differs in having the surface less opaque, elytral interstices shining, hind tibiae with an apical hook, and metasternum non-tuberculate.

TESSERODON VARIOLOSUS Macl.

Two specimens from Groote Eylandt appear to represent a variety of this species; they are smaller (4·5–4·75 mm.) than usual, and have the elytral interstices slightly elevated posteriorly.

TESSERODON INTRICATUS sp. nov.

♂ Black, antennae palpi and tarsi reddish, club flavous. Under-surface and legs rather sparsely clothed, upper-surface with very short setae.

Head with crowded and fairly large asperate punctures. Clypeus with two conspicuous median projections, and two smaller submedian ones, separated by notches. Prothorax more than twice as wide as the median length, front angles produced and rounded, hind ones obtuse; with crowded longitudinal punctures, many of which are confluent. Elytra with sides rounded and evenly continuous with those of prothorax, with narrow geminate striae, interstices wide, elevated and shining in middle, with a row of large but shallow setiferous punctures on each side. Metasternum with large squamose punctures, sparser in middle than on sides. Front tibiae stout and strongly tridentate, hind ones rather thin, with an inner apical hook. Length, 5·5–6 mm.

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(2) London edition, 1832, xiv, pl. xlv, fig. 3.
(3) Reiche, Ann. Soc. Ent. Fr., 1842, p. 72, pl. v, fig. 2.
(4) Westwood, Trans. Ent. Soc. iv, pl. viii, fig. 3.

♀ Differs in having the hind tibiae without an apical hook, and the teeth of the front ones somewhat larger.

Hab. Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15426.

Like *T. gestroi* on a greatly reduced scale, but the prothoracic punctures are narrower and the middle of each interstice more distinctly elevated; on *T. variolosus* they are scarcely separately convex. The rows of setae on the elytra are short, pale, and slope backwards.

MONOPLISTES.

The species here referred to *Monoplistes* in general resemble small specimens of *Temnoplectron*, but have the claws unarmed, although somewhat thickened at the base. They all have the middle and hind tibiae strongly curved, and each with a long apical spur that at first glance appears to be part of the tibia itself. The pygidium near its summit is traversed by a narrow deep line.

MONOPLISTES CURVIPES sp. nov.

♂ Black, highly polished; antennae, palpi, and tarsi more or less reddish.

Head gently convex, with rather small punctures, becoming larger and denser on sides; front with six acute teeth, the two median ones longer than the others, and the notch between them deeper. Prothorax widely transverse, front angles strongly produced and very acute, sides widely dilated to near base, and then slightly narrowed to base, median line well defined near base, but disappearing before middle; with a wide shallow sub-basal depression near each side; punctures sparse and minute, but becoming larger and more numerous, although not crowded on sides, a row of large ones at extreme base. Elytra closely embracing prothorax, base strongly incurved; with slightly impressed but distinct striae containing small, distant punctures. Flanks of sterna with rather dense, asperate punctures. Front tibiae long, thin, strongly curved, with two small and fairly large acute teeth; middle and hind tibiae moderately curved and each with a long spur, continuing the curve. Length, 6–7·5 mm.

♀ Differs in having the head smaller, prothorax longer, more evenly convex, sides strongly but almost evenly rounded, sublateral foveae smaller but deeper, front tibiae much shorter, less strongly curved, more dilated at apex, notched on inner side near base, and the other tibiae shorter.

Hab. Queensland: Mulgrave and Little Mulgrave Rivers (H. Hacker), Cairns district (A. M. Lea). Type, I. 3719.

There is a swelling near the base of each claw, but as it is not at all acute the species was referred to *Monoplistes* rather than to *Temnoplectron*, to which at

first it appears to belong; the male resembles *T. tibiale*, but in that species the claws are acutely dentate and the tibial spurs are very different. On three specimens the legs are entirely reddish, probably from immaturity. The sides of the prothorax are more conspicuously dilated to near the base on one male than on another, and are notably upturned before narrowing to the base.

MONOPLISTES PHANOPHILUS sp. nov.

Black, highly polished; antennae, palpi, and tarsi pale reddish.

Head slightly convex and with small and rather sparse punctures between eyes, becoming larger and more numerous but scarcely crowded on sides; front with six teeth, of which the median ones are fairly long, acute, and separated by a deep notch, the others are much smaller and separated by shallow notches. Prothorax about twice as wide as the median length, sides parallel on basal half, then oblique to apex, where the angles are acute; with small and numerous but not dense, sharply defined punctures, and a row of somewhat larger ones at base; sublateral foveae vaguely defined. Elytra closely applied to prothorax, sides gently rounded; with narrow striae, containing rather small, distant punctures; interstices with very small punctures. Metasternum with large but shallow subreticulate punctures on sides, minute ones in middle. Front femora stout and moderately dentate; front tibiae rather strongly curved, dilated, and with a strong tooth at outer apex and two small ones near it, distinctly notched near inner base; other tibiae distinctly curved, and each with a long terminal spur. Length, 5–5·25 mm.

Hab. Queensland: Gordonvale and Cairns, at lights (Dr. J. F. Illingworth). Type, I. 15429.

Smaller than *M. curvipes*, from the female of which it differs in the prothorax with sides partly parallel, with somewhat larger punctures, and less distinct sublateral foveae, and front tibiae with inner basal notch more conspicuous. Of four specimens taken by Dr. Illingworth, two have the front tibiae somewhat longer and thinner than the others, but not to such a striking extent as on *M. curvipes*, so they are possibly all females. Two specimens from the Simson collection from Bowen (Queensland) differ in having the punctures on the head somewhat denser and coarser, and the punctures in the elytral striae slightly larger. Another from the Northern Territory (from Dr. Bovill in the Blackburn collection) has punctures on the head similar to those on the Bowen specimens, but those in the elytral striae are smaller; the notch at the inner base of its front tibiae is preceded by a conspicuous tubercle, that on the other specimens appears more as the sudden termination of a ridge. This specimen, by its number in Blackburn's note-book, was doubtfully identified as

M. haroldi, but it is considerably larger than the type of that species (3 mm.) and the head is not "*sat fortiter granulato.*"

Var.? A. Fourteen specimens without locality labels (but probably from the Northern Territory, and two of them bearing Blackburn's No. 7279) have punctures as in the Bowen specimens, but are less shining, and the elytra are shagreened and opaque; if this condition is natural they probably represent an undescribed species.

Var.? B. Six specimens similarly pinned to A (and two also bearing Blackburn's No. 7279) are structurally similar, but the elytra are not shagreened or opaque; their sides, from front of head to tips of elytra, are obscurely reddish, but to a variable extent.

MONOPLISTES TROPICUS sp. nov.

Black, highly polished, legs obscurely reddish, antennae, palpi, and tarsi paler, club infuscated.

Head gently convex and with minute punctures between eyes, larger and more numerous, but not crowded, ones on sides; front with six acute teeth, of which the median ones are longer and more acute than the others. Prothorax more than twice as wide as the median length, sides very narrowly margined, admost parallel on basal two-thirds, then oblique to apex, where the angles are slightly produced but very acute; with minute but sharply defined punctures, and a row of larger ones at base. Elytra closely applied to prothorax; with narrow but well defined striae, containing small distant punctures, interstices feebly separately convex, and with scarcely visible punctures. Metasternum with dense and rather large punctures on sides, becoming very minute in middle. Front femora moderately dentate; front tibiae moderately curved, apex dilated, with three acute outer teeth, the apical one much larger than the others, notched near inner base; hind tibiae moderately curved, and each with a long terminal spur. Length, 3·5–4 mm.

Hab. Queensland: Cairns district (F. P. Dodd and A. M. Lea). Type, I. 15435.

A briefly oblong-elliptic species, smaller than *M. phanophilus*, and elytral striae more deeply impressed, with the interstices feebly separately convex. The larger specimen has much less acute tibial teeth than the type (which was taken from a sticky seed of *Pisonia brunoniana*), but this may be due to abrasion. Two specimens from Wyndham (J. Clark from W. Crawshaw) appear to belong to the species, but have the punctures in the elytral striae slightly larger and closer together, and the punctures on the interstices rather sharply defined, although very minute.

EPILISSUS USTULATUS Lansb.

Five specimens, from Cairns and the Little Mulgrave River, probably belong to this species; four of them have the shoulders conspicuously paler than the adjacent parts; of these four, two have the apical sides and epipleurae also pale, of these two, one is mostly blackish, the other mostly castaneous; the fifth specimen has the entire upper-surface dark piceous-brown. They all differ from the description, however, in having the club of the antennae partly infuscated, and the front tibiae acutely bidentate outwardly, but there is a blunt tooth at the inner apex. If correctly identified the species should be transferred to *Panelus*.

PANELUS BIDENTATUS Wilson.

Three specimens, taken from rotting leaves at Ourimbah and National Park (New South Wales), and Mount Tambourine (Queensland), structurally agree with the type, but they all differ somewhat in colour. On the National Park specimen the pale humeral and subapical spots on each elytron are enlarged and connected along the side; on the Ourimbah one the pale parts of each elytron are further enlarged to cover most of the surface, leaving only a moderate infuscation about the scutellum, the head and prothorax are also almost entirely pale; on the Mount Tambourine specimen the prothorax and elytra are entirely dark.

PANELUS PISONIAE sp. nov.

Pale flavo-castaneous, highly polished, extreme base and suture of elytra very narrowly black, club infuscated.

Head gently convex and with minute punctures between eyes, a subtriangular projection on each side of a deep medioapical notch. Prothorax more than twice as wide as the median length, sides on basal two-thirds subparallel, then oblique to apex, where the angles are acute; punctures minute, but a row of slightly larger ones at extreme base. Elytra closely applied to prothorax; striae faintly impressed, interstices with minute punctures. Front tibiae bidentate externally, the apical tooth larger than the other. Length, 2–2·5 mm.

Hab. Northern Queensland (Blackburn's collection), Cairns district, taken in abundance from sticky seeds of *Pisonia brunoniana* (F. P. Dodd). Type, I. 15432.

The pale colour and feeble elytral striation at once distinguish this species from *P. pygmaeus*; the persistently smaller size and paler colour from *P. bidentatus*. On most specimens there appears to be a large infuscated spot near the apex of each elytron, but this is entirely due to the apical fold of the wings showing through. On most specimens the elytral striae are very feeble and traceable only near base, but on some of the smaller ones they are fairly distinct, and contain small, distant punctures.

LABROMA HORRENS Sharp.[5]

Menthophilus tuberculatus Waterh.[6].

Plate vi, fig. 6.

These names were founded upon one species; apparently *L. horrens* has precedence.

AULACOPRIS REICHEI White.

Plate vi, figs. 8, 9.

This is the largest, finest, and one of the rarest dung beetles in Australia. Single specimens have been taken in Queensland, New South Wales, and Victoria, but Mr. Edgar R. Waite obtained two specimens in the Yessabah caves on the Macleay River; they had formed sixteen bat-dung balls of the size of walnuts, each containing a larva or pupa (in one instance an egg). After being exhibited at a meeting of the Linnean Society of New South Wales[7] some of them were reared to maturity in the Australian Museum.

MERODONTUS CALCARATUS Macl.

Plate vi, fig. 11.

The small and narrow eyes of this species are shining and scarcely visibly faceted, each is flat and surrounded by a slightly elevated margin, so that it appears to be slightly concave. The tooth on the hind femora is twice as large on some specimens as on others.

COPTODACTYLA BAILEYI Blackb.

I concur with Blackburn's opinion that *C. baileyi* is distinct from *C. glabricollis*.

COPTODACTYLA DUCALIS Blackb.

C. acuticeps Felsche.

Plate vi, figs. 10, 11.

Felsche considered that *C. ducalis* also was a synonym of *C. glabricollis*; only the female was known to Blackburn, but it is abundantly distinct from *glabricollis*; the male was described by Felsche himself as *C. acuticeps*.

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(5) Sharp, Rev. et Mag. Zool., 1873, p. 263.
(6) Waterhouse, Ent. Mo. Mag., Jan., 1874, p. 176.
(7) Proc. Linn. Soc. N. S. Wales, 1898, p. 803.

ONTHOPHAGUS.

Specimens of the Australian species of *Onthophagus* known to Blackburn are before me, with the exception of *O. bipustulatus*, *O. carmodensis*, and *O. helmsi*. I have carefully tried to follow his grouping of the species, but am unable to do so, even his Group 1, consisting of a few large species, appears to be scarcely distinguishable, by the basal edging of the pronotum alone, from some members of other groups, as many of these have the marginal edging even throughout, although not so highly elevated as on those he referred to Group 1. The species of Group 4 might well be distributed between those of all groups, except 1. The difference between a flat or feebly convex base and one very faintly concave is so slight that it can seldom be of much use, so that I follow Arrow, who considered that "The supposed difference in the prothoracic margin is illusory." Blackburn considered that tables based largely on male characters are not desirable, but they have at least the advantage of enabling many species to be quickly identified, thus serving at least one of the main uses of a table. Probably had he used the facets of the eyes, for the primary divisions, the tables would have been more satisfactory, even although they apparently alter on some specimens on drying, their true nature is generally at once evident if they are viewed from oblique directions; the clypeal suture could also have been used to a greater extent, although with some species it varies sexually.

ONTHOPHAGUS AUSTRALIS Guer.

Plate viii, figs. 31–33.

The whole upper-surface of fresh specimens of this species has a curious satiny gloss; the interocular horns and ridge of the male vary considerably.

ONTHOPHAGUS MASTERSI Macl.

Plate viii, figs. 34, 35.

In Blackburn's table this species is separated from *O. australis* by being "Black, not at all metallic"; but on the male the prothorax has sometimes an obscure metallic-green gloss; structurally it is extremely close to some forms of *O. australis*.

ONTHOPHAGUS MACROCEPHALUS Kirby.

Plate viii, figs. 36, 37.

The cephalic horn on the male of this species sometimes extends almost to the elytra, but it is usually much shorter.

ONTHOPHAGUS LAMINATUS Macl.

Plate vii, figs. 12–20.

In commenting on *O. quinquetuberculatus,* Blackburn(8) considered the name was probably a synonym of *O. atrox.* If Macleay rightly mated the specimens standing as types (and this certainly appears to be the case), the male is a specimen of the species Blackburn identified as *O. atrox,* with the punctures of the prothorax less coarse than usual, and with its median prominence more produced and narrower at the tip than usual; the head and elytra being in exact agreement. The female agrees with specimens identified by Blackburn as *O. pugnax.*

As with many other species of the genus, the sexes may differ strongly, or approach each other so closely that from external observation of the upper-surface it is difficult to decide as to the sex of an individual. A freshly matured specimen is often much more polished than an old one, and with age the clothing (Blackburn relied upon this in *O. atrox*) is apt to become abraded, tibial teeth, and projections on the head (especially the front ones used for shovelling), and prothorax to become blunted, etc.

I believe that but few of the names treated as distinct in Blackburn's Group 2, up to and inclusive of *O. pugnacior,* can be maintained, and that the character, "The basal gutter of the pronotum dilated hindward in the middle," as against "not dilated hindward," to be quite worthless; the differences there are slight, only of degree, and liable to individual rather than specific variation, and the other characters used are mostly of degree. Blackburn partly relied upon the crenulations of the front tibiae of *O. cowleyi* as a useful distinguishing feature from those of *O. laminatus,* but on two of the specimens he had as *O. laminatus,* and bearing the same number (1424), one specimen has respectively eight and nine on the front tibiae, and the other five and six; on *O. cowleyi* they were noted as six or seven. The punctures of the prothorax are decidedly variable, but the elytra are always fine shagreened and with small scattered punctures; the striae are also but little liable to variation.

From the specimens in the South Australian Museum, being those examined by Blackburn, with the exception of a few specimens (only the type of *O. palmerstoni* was known to him, but I have carefully examined his description of that form), it appears probable that the synonymy is as follows:

laminatus, Macl., 1863 (*pugnax,* Har., 1868; *cowleyi,* Blackb., 1903).

atrox, Har., 1867 (*quinquetuberculatus,* Macl., 1871; *palmerstoni,* Blackb., 1903; *sloanei,* Blackb., 1903; *pugnacior,* Blackb., 1903).

With the distinct possibility that all the names should be regarded as

(8) Trans. Roy. Soc. S. Aust., 1903, p. 274.

synonymous, with *laminatus* (certainly not the most abundant form) having priority. There are also many other forms before me that differ slightly from the various forms known to Blackburn, but it does not appear desirable to name them, even as varieties.

ONTHOPHAGUS FURCATICEPS Masters.

O. furcatus Macl., n. pr.
O. froggatti Macl.
O. lobicollis Macl., var.

Plate ix, figs. 61–63.

The types of *O. furcaticeps* and of *O. froggatti* differ slightly in colour, but on placing them side by side a few years ago I could find no structural differences. The female differs from the male in having the clypeus coarsely sculptured, the inter-ocular carina elevated into a short wide triangle on each side, the prothorax with a bilobed protuberance in front (very variable in size), on each side of which is a deep cavity, and the front tibiae shorter and stouter; the prothorax has a gloss varying from greenish to purplish.

A specimen that was compared with the type of *O. lobicollis* and agreed well with it has the apical segment of the abdomen not at all narrowed in its middle, so is evidently a female(9); the remarkable development of the prothoracic process appears to be an exaggeration of that of the female of *O. furcaticeps,* of which it should be regarded as a variety.

ONTHOPHAGUS WALTERI Macl.

Plate ix, figs. 64, 65.

On the female of this species the interocular ridge is gently convex throughout, on the male it is elevated on each side near the eye and vanishes in the middle; the prothoracic processes vary in size on the male, and on the female have a worn-down appearance. On the male the two apical segments of abdomen are strongly narrowed to the middle, the apical one almost vanishing there.

ONTHOPHAGUS FISSICEPS Macl.

Plate vii, figs. 21, 22.

Six specimens from Wyndham (three of each sex) evidently belong to this species, but they are all smaller (10–12 mm.) than the type (6 lines). The facets of the eyes are distinct, and in Blackburn's table the species would be referred to

(9) Arrow, Ann. and Mag. Nat. Hist., Oct., 1920, p. 435.

Group 3, near *O. capella,* although it is nearer to *O. erichsoni,* but the prothorax has the median projections more divergent in the male, the punctures coarsely rugose, the head with a strongly arched line between the eyes, and the clypeus notched. The female differs from the male in having the carina between the eyes narrowly elevated and less curved, the space between it and the clypeal suture with denser and larger punctures, the clypeus less notched, prothorax with median projections replaced by a ridge (emarginate in its middle, somewhat as on *O. pugnax*), and the front tibiae much shorter. From the female of *O. erichsoni* it differs in the coarser prothoracic and cephalic punctures, and by the interocular ridge being less elevated in the middle. It is probable that the type of *O. integriceps* (noted by Macleay as a male) is really a female of *O. fissiceps.*

ONTHOPHAGUS CUNICULUS Macl.

Plate ix, figs. 66, 67.

The head and prothorax of this species are sometimes coppery-purple; the metallic part of the head usually terminates at the clypeal suture in the female, slightly beyond it in the male.

ONTHOPHAGUS CONSPICUUS Macl.

Plate viii, figs. 38, 39.

On an occasional specimen of this species the head and prothorax (except the basal gutter) are of a bronzy-purple, and the elytra purplish-green.

ONTHOPHAGUS NODULIFER Har.

Plate viii, figs. 40, 41.

The males of this species vary greatly in the processes of the head and prothorax. The various forms before me are as follows:

1. Cephalic horns thin, strongly curved, each distinctly longer than the head is wide; clypeus almost evenly arched in front, prothoracic protuberance beginning as a median carina and projecting forwards over a medio-apical cavity. Var. *divaricatus* Macl. Gayndah (Queensland).

2. As 1, but prothoracic protuberance considerably reduced in size and blunt. The typical form. Rockhampton (Queensland).

3. Cephalic horns much shorter and stouter, scarcely one-third as long as the head is wide; clypeus with two feeble projections in front; prothoracic protuberance an obtuse tubercle capping a slight hollow. Emerald (Queensland).

4. As 3, but clypeus evenly arched except for a slight incurvature in middle. Northern Queensland.

5. Interocular ridge arched forwards, but its sides not elevated into horns or tubercles, clypeus evenly arched, except that its middle is truncated; prothoracic protuberance very feeble, no depression in front of it. Bowen (Queensland).

6. As 5, but clypeus with two projections in front. Connexion Island (Northern Territory) and Derby (North-western Australia).

All these forms have the eyes large, without distinct facets, clypeal carina almost evenly arched backwards with the middle slightly elevated, prothorax with shallow but not very small punctures, distinct on the feebly-armed specimens, tending to obliteration on the strongly-armed ones, with margins distinct throughout, and elytra shagreened and opaque.

ONTHOPHAGUS DUNNINGI Har.

Plate ix, figs. 68, 69.

A rare species, which appears to live solely in agaric fungi; the horns on the head and prothorax of the male vary considerably in length.

ONTHOPHAGUS HAAGI Har.

Plate viii, figs. 42–44.

A very distinct species, but varies greatly in size; on the female the interocular ridge is sometimes moderately elevated and interrupted in middle, sometimes strongly elevated and almost even throughout, on others with a conspicuous process (almost a horn) on each side of it; the horn on the head of the male varies in length, but its summit is always distinctly bifid.

ONTHOPHAGUS FEROX Har.

Plate vii, figs 23, 24.

On some specimens of this species the cephalic horn is little more than a short conical tubercle, on others it is much longer and rises well above the level of the pronotum; the prothoracic horns also vary greatly in length and acuteness.

ONTHOPHAGUS PENTACANTHUS Har.

Plate vii, figs. 25, 26.

The median processes of the prothorax and the cephalic horn of this species vary in much the same way as do those of *O. ferox*.

ONTHOPHAGUS PROMPTUS Har.

The type of this species was almost certainly a female. Specimens of both sexes were taken on Groote Eylandt, and others before me are from Darwin and Cape York. The male differs from the female in having the clypeus not transversely vermiculate, but with fairly dense and rather shallow punctures, the prothorax wider, somewhat retuse in front and apical segment of abdomen incurved to middle; the lateral margins of the prothorax are distinct, but the base appears to be immarginate, unless separated from the elytra, when a very feeble margin may be seen. The eyes are narrow and with distinct facets. In general appearance the species resembles *O. margaretensis* on a large scale, but the female differs from the type (a female) of that species in having the clypeus truncated in front, the interocular ridge less abruptly elevated and somewhat sinuous, prothorax with smaller punctures, and median line well defined on at least the basal half, instead of but feebly defined and close to the base only.

ONTHOPHAGUS PLANICOLLIS Har.

Plate ix, fig. 70.

A specimen from Moa or Banks Island (near the original locality, Somerset) evidently belongs to this species, as its elytra have the alternate interstices elevated and with rows of granules, but these granules and the large punctures on the head and prothorax are each supplied with a stiff upright seta; no setae were mentioned in the description before me (a written copy of the original one), so that probably the type was abraded.

ONTHOPHAGUS ANISOCERUS Er.

O. fuliginosus Er.

Plate viii, figs. 45–47.

In his table Blackburn separated these forms by the crenulations of the elytra, "distinctly punctiform" in *O. anisocerus* and "not punctiform" in *O. fuliginosus*, but the specimens from his collection (now in the South Australian Museum) do not warrant specific separation. Erichson apparently relied upon the differences in colour and in the cephalic horns, but these are all variable, the lateral horns are twice as long on some Tasmanian specimens as on others, and the median process varies from feebly elevated and scarcely double to strongly elevated and conspicuously bifid, so that I cannot regard *O. fuliginosus* as deserving even of a varietal name. Two males, from the Queensland National Park, have the lateral horns longer than usual, with the median process in the form of a

long-based Y; another male, taken with them, has the process represented by a feeble node only.

ONTHOPHAGUS PRONUS Er.

Plate vii, fig. 27.

This species varies considerably in size. On some males the prothoracic horn projects beyond the head, on others it terminates short of the clypeus.

ONTHOPHAGUS TWEEDENSIS Blackb.

Plate viii, figs. 48, 49.

Of three males of this species before me (from Stradbroke Island) each has the elevation between the cephalic horns trilobed and the suture greenish. The female (three from Stradbroke Island and one from Bribie Island) differs from the male in having denser and coarser punctures on the head, no horns between the eyes, but a feeble ridge curved backwards, the prothorax with coarser punctures and scarcely retuse in front, and the front tibiae shorter, with stouter teeth.

ONTHOPHAGUS HENLEYENSIS Blackb.

A specimen from Yilgarn, unfortunately without antennae or tarsi, possibly belongs to this species, but differs from some typical specimens in having the prothorax conspicuously greenish, less convex, with smaller punctures and a distinct medio-apical depression.

ONTHOPHAGUS BOVILLI Blackb.

Plate viii, fig. 50.

The type of *O. bovilli* has the apical segment of abdomen not at all narrowed in the middle, so it is a female, as suspected by Blackburn; it is much less metallic than is usual in *O. conspicuus*, but both sexes of that species vary considerably in colours and structure, and I can only regard the type in question as a rather dingy female of it.

ONTHOPHAGUS VICTORIENSIS Blackb.

O. jungi Blackb.

Plate viii, figs. 51, 52.

The type of *O. victoriensis* is represented in the South Australian Museum by a fragment (its head and prothorax are missing). It belongs to the species subsequently named *O. jungi*, and of which Mr. J. C. Goudie mounted sexes on one card from Birchip, Victoria.

ONTHOPHAGUS TAMWORTHI Blackb.

Of this species two specimens, sexes, were known to Blackburn. The male is now in the British Museum, but the female is before me; they were both badly abraded and dull, and were described as "*supra glaber . . . . minus nitidus, coriaceus.*" Two specimens from Collarenebri (New South Wales) quite evidently belong to the species: they have the prothorax shining and the upper-surface conspicuously clothed; on the prothorax the hairs are erect, fairly dense, and in parts almost as long as the distance between the cephalic carinae, but they are absent from the slightly depressed median space; there are fairly numerous hairs on the head, except behind the interocular ridge (the ridge on the male, as viewed from behind, appears to be moderately arched forwards, and rather acutely and evenly elevated); on the elytra the hairs are sparser and less erect, and from behind appear in two regular rows on each interstice. The male, from Collarenebri, is 6 mm., the female 5 mm.; the female has an obscure purplish gloss, instead of an obscure greenish one.

ONTHOPHAGUS LEAI Blackb.

Plate vii, figs. 28, 29.

The interocular ridge on this species varies considerably; it is usually about two or three times as wide as high, with the top even, but the middle of the ridge is often triangularly elevated; on one specimen from Bathurst (New South Wales) the ridge is much higher than usual, with its summit conspicuously trifid. The prothoracic horns project forward much as on *O. ferox*, but are wider and flatter. Specimens are often attracted to lights.

ONTHOPHAGUS COMPEREI Blackb.

Plate viii, figs. 53–56.

The cephalic horns on the males of this species vary considerably in size: on some they are subconical, rather short, and almost simple; on one specimen they are long, curve inwards at the summit, and are slightly dentate, both internally and externally.

ONTHOPHAGUS HOPLOCERUS sp. nov.

Plate viii, figs. 57, 58.

♂ Black, antennae and tarsi reddish, club paler. Under-surface and legs with rusty-red hairs.

Head wide, sides behind clypeal suture slightly dilated, and then strongly narrowed to base; two rather narrow and almost vertical horns between eyes,

each horn near an eye and with a strong tooth at its inner basal third, between the two horns a rather narrow notched elevation, slightly higher than the teeth of the horns; between the horns and the clypeal suture with sparse and small punctures, elsewhere with dense and fairly coarse ones. Clypeus moderately elevated and almost truncated in front, thence strongly dilated and with a slight incurvature to near base, the sides for a short basal space almost parallel, suture carinated and trisinuate, the median sinus wider than the others combined. Eyes very narrow, with distinct facets. Prothorax wide, front portion retuse, with a slight median swelling; with fairly large, dense, and sharply defined punctures, smaller and sparser on parts of the retuse portion than elsewhere, sides considerably dilated near middle, where they are wider than elytra, front angles moderately acute, hind ones widely rounded off, margins narrow and distinct throughout; lateral foveae rather large and with distinct punctures; median line shallow, but distinct on basal half. Elytra shagreened and opaque; striae very narrow, shining, and with distant punctures; interstices with small, subobsolete punctures, becoming larger but still shallow on sides. Pygidium with sharply defined punctures, slightly smaller than on prothorax. Metasternum with large and small irregularly distributed punctures. Length, 10·5–11·5 mm.

♀ Differs in having the head smaller, with the sides from the widest part (level with the front of the eyes) obliquely decreasing, with a slightly rounded outline to the front of the clypeus, which is much less elevated, the punctures on the clypeus are coarser and mostly confluent, the space between it and the interocular ridge has coarse and dense punctures, and the ridge is shining, almost impunctate, and but feebly elevated; the prothorax is less dilated on the sides and scarcely retuse in front, the elytra are less opaque, and with larger punctures, and the front legs are shorter, with wider tibiae and stouter teeth.

Hab. Victoria: Alps (H. W. Davey). Type, I. 15394.

Readily distinguished from all other species known to me, except ***O. comperei*** and ***O. victoriensis,*** by the horn near each eye of the male being compound; on some males of the former species the horn is dentate outwardly as well as inwardly, and its head is without the conspicuous notched median process; on the male of the latter species there is a small conical projection between the horns, the clypeus is deeply notched in front, and the elytra are very different. The head of the male, at first glance, has a curiously angular appearance, almost octagonal. In describing the shape of the eyes of this and other species their upper surface is referred to; the lower parts of all the species I have examined are large and convex, more or less globular.

Mr. F. E. Wilson has recently taken (at Lakes Entrance, Victoria) three specimens that appear to belong to the species; a female agrees perfectly with

one taken by Mr. Davey, but two males have the horns greatly reduced in size, still nearer vertical, and with the tooth on each smaller, although quite distinct; the median elevation is reduced to appear as two almost equilaterally triangular processes joined at the base, rather than a single bifid elevation.

ONTHOPHAGUS MAMILLATUS sp. nov.

Plate ix, fig. 71.

♂ Black, subopaque; antennae, palpi, and tarsi dull reddish, club paler. Under-surface and legs with more or less rusty-red hair.

Head rather large, sides behind clypeal suture slightly dilated and then strongly narrowed; interocular ridge narrow and with three small prominences, of which the median one is the largest; between the ridge and the clypeal suture polished and with smaller punctures than elsewhere. Clypeus with sides strongly narrowed and slightly incurved from base to apex, which is gently rounded and strongly upcurved; hind suture carinated, the median portion straight and wider than the combined width of the sides; with fairly dense and sharply defined punctures at apex and sides separated by vermiculate ridges. Eyes rather narrow, facets fairly distinct. Prothorax rather large, front portion retuse; with two fairly acute processes rather close together at apical third, a shallow median line from between them to base; sides strongly dilated, front angles obtusely pointed, hind ones very wide; margins and marginal gutter distinct throughout, but enfeebled about hind angles; punctures rather sharply defined only about lateral foveae, where they are of moderate size, elsewhere although not minute they are very ill-defined, and completely vanish in some parts. Elytra shagreened, with small and indistinct punctures; striae very narrow, shining, and with distant punctures. Pygidium shagreened, and with rather feebly defined punctures. Metasternum with dense, asperate punctures on sides, becoming sparser and more sharply defined about middle. Apical segment of abdomen strongly narrowed to middle. Length, 10–13 mm.

♀ Differs in having the head smaller, with the sides narrowed from nearer the base, clypeus with vermiculate ridges throughout (except on the elevated margins), prothoracic tubercles smaller, apical segment of abdomen very slightly narrowed in middle, and front tibiae slightly shorter, with wider teeth.

Hab. Queensland: Mount Tambourine (H. Hacker, H. Pottinger, and A. M. Lea). Type, I. 3750.

The prothoracic processes of the two males appear rather acute from above, but from the sides they are seen to be flattened, with the front edge almost vertical; when seen from behind each appears to overhang a space halfway between the median elevation of the interocular ridge, and one of the side ones. Of seven

females, two large ones have the prothoracic tubercles as large as on the males, although more obtuse, five small ones have them smaller and more obtuse; the large females also have the interocular elevations longer and more acute than on the males, the median one appearing as a short horn about half the length of the clypeus. The two large females have the appearance, in comparison with all the others, of being males, but the shape of the apical segment of the abdomen renders it certain that they are females, and that the two smaller ones are males. The elytra are somewhat as on *O. macrocephalus*, *O. declivis*, and *O. schmeltzi*, but the head and prothorax are very different from those of those species, or of any other before me.

ONTHOPHAGUS ANCHOMMATUS sp. nov.

Plate ix, fig. 72.

♂ Black, shining, parts of head and of legs obscurely reddish, antennae, palpi and tarsi paler, club and several of the preceding joints flavous. Undersurface and legs with hairs varying from almost white to rusty-red.

Head with rather sparse but sharply defined punctures on basal half, interocular ridge narrowly elevated in middle, each side elevated into a rather wide subtriangular horn. Clypeus with suture strongly trisinuate, the median sinus strongly carinated, arched forwards, and wider than the others combined, sides in front of suture subparallel for a short distance, then strongly incurved to apex, which is gently rounded and strongly elevated; punctures rather sparse in middle and more numerous on sides. Eyes very narrow and with distinct facets. Prothorax slightly wider than elytra, a wide median process, widely triangular in front, overhanging head, a vague median line on basal half; apex and sides narrowly margined, base depressed and immarginate; punctures dense, rather large, and sharply defined, densest of all on apex of process. Elytra with narrow striae, interstices moderately convex and with fairly large sharply defined punctures, denser on sides than elsewhere. Metasternum with fairly large and dense punctures on sides, becoming sparser and mixed with small ones in middle. Apical segment of abdomen very narrow in middle; pygidium with large, crowded punctures. Length, 7·5–8·5 mm.

♀ Differs in having the head smaller, the interocular ridge with a wide triangular elevation in middle, as well as with short lateral horns; clypeus smaller, apex less strongly upturned (although more strongly than is usual in females of the genus), with dense punctures, mostly transversely confluent (or vermiculate); prothorax with median process almost straight in front, not overhanging head, and narrowed to its base, apical segment of abdomen scarcely narrowed in middle, and front tibiae shorter and wider with wider teeth.

Hab. Queensland: Brisbane, in November and January (H. Hacker). Type, in Queensland Museum; cotype, I. 15400, in South Australian Museum.

An isolated species, at first glance approaching *O. latro,* but head and prothorax very different. The clypeus of the male is so strongly elevated in front than if the elevated part were bent backwards it would touch the middle of the suture. The cotype male has the medio-apical process of the prothorax intermediate in shape between that of the type male and its female.

ONTHOPHAGUS TRICAVICOLLIS sp. nov.

Plate ix, figs. 73, 74.

♂ Black, shining; head, except clypeus, and prothorax, except projecting parts, coppery-green; antennae, palpi, and tarsi obscurely reddish; club and some of the preceding joints flavous. Under-surface and legs with more or less rusty-red hair.

Head rather large, sides angularly dilated in middle, between clypeal suture and interocular ridge, with small and sparse, but sharply defined punctures, becoming larger on sides, behind the ridge almost impunctate; ridge narrow, near each eye briefly subtriangularly elevated. Clypeus with suture carinated and very feebly sinuous, sides strongly obliquely narrowed to apex, which is strongly elevated and almost truncated; with sparse and minute punctures in middle, becoming larger and more numerous but not dense on sides. Eyes rather narrow and with distinct facets. Prothorax large, distinctly wider than head; a large trilobed mass in front, the lobes rounded on their upper parts, almost vertical in front, and not at all greenish; a large excavation between them and each side, the excavation with an overhanging subconical tubercle near the lateral fovea, which opens in front into the excavation; front angles distinctly produced but truncated; sides narrowly margined and with a narrow gutter, base almost immarginate; median line very feeble; with fairly numerous and rather feeble punctures, more sharply defined about the lateral foveae than elsewhere, and absent from most of the excavated parts. Elytra with narrow striae, interstices moderately convex, with fairly numerous and small but distinct punctures. Metasternum opaque and with fairly dense punctures, except in middle, which is shining and with a few large and some very small ones. Three apical segments of abdomen narrowed in middle; pygidium subopaque and with irregular punctures. Front tibiae long. Length, 9–12 mm.

♀ Differs in having the head smaller, less dilated in middle, interocular ridge evenly elevated throughout, many distinct but small punctures behind it, clypeus smaller, less elevated in front, and closely transversely vermiculate; prothorax with four small dark tubercles at summit of the frontal slope, the two

median ones more distant from each other than from the others, the space between them and the apex scarcely depressed, but slightly excavated in front between them and the others, the excavated parts almost impunctate, elsewhere with more distinct punctures than on the male; apical segment of abdomen scarcely narrowed in middle and front tibiae considerably shorter, with wider teeth.

Hab. Queensland: Coen River (W. D. Dodd), Mulgrave River (H. Hacker), Cairns (A. M. Lea), Bowen (Aug. Simson). Type, I. 3775.

In many respects like *O. conspicuus*, but the elytra are not at all metallic and not smoothly shagreened; on the male the clypeus is much less notched in front than on that species, the median projections of the prothorax look very different from in front, the front angles are truncated, and the front legs are considerably longer. The middle of the metasternum usually has a distinct greenish gloss, and there is usually a faint greenish gloss on the abdomen and legs. The clypeal suture, when seen directly from above, appears almost straight throughout. In addition to the fairly sharp punctures on the elytra, there are others more or less obliquely conjoined, giving the appearance of briefly oblique strigosities. One male has the prothorax with rather larger punctures than usual, and with a small fovea near the middle of its base, its clypeal suture is also more distinctly sinuous than on the other males, although it is not trisinuate. On females in good condition the interocular and clypeal ridges have a golden gloss.

ONTHOPHAGUS BICAVICOLLIS sp. nov.

Plate viii, fig. 59.

♂ Black; head (except front of clypeus) and prothorax bright metallic green, some of the elevated parts coppery; elytra and pygidium purplish, in some lights greenish, parts of legs obscurely diluted with red, antennae flavous; pygidium and under-surface sparsely clothed, upper-surface glabrous.

Head strongly dilated in front of eyes; with fairly large and dense (sometimes confluent) punctures between clypeal suture and interocular ridge, the ridge feebly elevated and strongly arched forwards, behind it with rather sparse and small punctures. Clypeus with suture carinated throughout, the carina oblique on sides, the median part four times as wide as each of the lateral parts; sides with margins rapidly rising to apex, strongly elevated and slightly incurved at middle; punctures at base more transversely confluent than behind the suture, becoming small and sparse in front. Eyes narrow, with distinct facets. Prothorax wide, sides strongly rounded, front angles strongly produced and somewhat sinuous, hind ones rounded off; a large excavation on each side of apex, each excavation with a subtriangular tubercle overhanging its base, and inwards with

an obtuse ridge (the space between the two ridges gently concave); with large, coarse punctures on sides, smaller and sparser, but still large, elsewhere, but absent from the excavations; median line rather wide and shallow; gutters fairly deep on sides, shallow at base. Elytra deeply and narrowly striated, the interstices separately distinctly convex, and with large punctures, usually with an oblique or transverse impression. Metasternum shagreened, and with rather small, asperate punctures on sides, middle shining and with small punctures, but with a few large ones near coxae. Two apical segments of abdomen strongly narrowed to middle; pygidium with large and small punctures intermixed. Front tibiae long, thin, and strongly arched near apex. Length, 11 mm.

Hab. Northern Territory: thirty miles east of Darwin (G. F. Hill). Type, I. 15501.

By its strongly narrowed apical segments of abdomen, and long front legs, the type certainly appears to be a male, although the projections and excavations of the pronotum approach those of some females of *O. conspicuus*, and some allied species; the elytra, however, are very different from those of *O. conspicuus*; from *O. tricavicollis* it differs in the feeble interocular elevation, and considerably larger and sparser elytral punctures; the shape of the prothorax and its punctures seem intermediate between those of the sexes of the latter species. Seen directly from above, the prothorax appears to have two small tubercles and two larger obtuse ones, the distance between the latter being equal to that between the eyes; viewed from behind, so that the head just disappears, the front appears to be 5-sinuate, the median sinus twice the width of each of the intermediate ones, and these much wider than the lateral ones.

ONTHOPHAGUS SPISSICOLLIS sp. nov.

Plate ix, fig. 75.

♀ Black, subopaque, in parts with a bronzy gloss; basal joints of antennae, parts of palpi and of tarsi obscurely reddish. Under-surface and legs with hairs varying from almost white to dark brown; head and most of prothorax with short, dense, upright, brownish setae; elytra with paler, shorter, and sloping setae, confined to one or two rows on each interstice.

Head wide, densely and coarsely punctate and subvermiculate, except behind interocular ridge, this acute in middle and strongly elevated at each side, but not horned; sides moderately elevated, slightly incurved at clypeal suture, and conspicuously produced on each side of a deep apical notch; clypeal suture trisinuate, finely carinated, the median portion feebly arched forward, and slightly elevated in middle. Eyes very narrow, facets distinct. Prothorax with front angles obtusely produced, margins distinct throughout, but slightly higher

on sides than elsewhere; with a feeble, obtusely pointed ridge in middle, about one-fifth from apex; with dense and coarse punctures, the intervening spaces with small punctures, a shagreened space without distinct punctures along middle from near the subapical ridge to base, and continued along each side at base, and on the side to near the sublateral fovea, each of these rather narrow and deep. Elytra with narrow, shining, geminate striae, with distant punctures, the interstices finely shagreened and with small, distant, setiferous punctures. Metasternum with irregularly distributed punctures of rather large size, with some small ones scattered about. Apical segment of abdomen not narrowed in middle; pygidium shagreened and feebly punctate. Length, 6–7 mm.

Hab. Western Australia: Beverley (F. H. du Boulay), Mount Barker (S. Macsorley). Type, I. 3774.

With the general appearance of the female of *O. adelaidae*, but differs in the interocular elevation, clypeal suture, prothorax with shagreened base and part of median line, medio-frontal prominence, etc.; in some respects it seems nearer to the female of *O. haagi*, but the elytra are without the conspicuous irregular series of elongated subgranular elevations of that species. On the prothorax, head, and elytral suture of the type the bronzy gloss is very conspicuous, but on the second specimen it is but slightly in evidence.

ONTHOPHAGUS VARIANUS sp. nov.

Plate ix, fig. 76.

♀ Black, shining; antennae, palpi, tarsi, and front coxae reddish, club paler; head (except clypeus) and prothorax coppery-green, elytra at base and sides reddish. Under-surface and legs with whitish and reddish hairs, sides of elytra with a few setae.

Head with sides angularly dilated in middle, interocular ridge in the form of a strong and almost evenly elevated carina; between it and clypeal suture with sharply defined punctures, of moderate size but not very dense, becoming denser on sides. Clypeus with sides but feebly elevated, apex almost truncate, surface densely transversely vermiculate; suture carinated and trisinuate, median sinus very feebly arched, about three-fifths of the total. Eyes very narrow, facets distinct. Prothorax large, sides strongly dilated, front angles (as seen from directly above) almost rectangular, margins and gutters distinct on sides, less distinct on apex and feeble at base; apical third with two large hollows, surmounted by three obtuse processes; parts of the hollows with large and fairly dense punctures, somewhat similar punctures on sides, rest of the surface with sparse and small punctures, and very minute ones; median line fairly distinct on basal half, sublateral foveae rather large. Elytra with narrow striae containing

distant punctures, these also partially impressed on the interstice at each side of a stria, interstices elsewhere with sparse and small punctures, but becoming larger on sides. Metasternum with dense and rather large punctures on sides, with a few large ones and minute ones elsewhere. Apical segment of abdomen not narrowed in middle; pygidium with rather coarse, crowded punctures. Length, 8·25 mm.

Hab. Queensland: Bowen (Aug. Simson). Type, I. 15410.

A beautiful species, the size of *O. rufosignatus*, but the red parts of elytra basal and lateral instead of apical, and the prothorax not at all reddish; *O. rubrimaculatus* is a much smaller species, with shagreened elytra, etc. The reddish parts of the elytra are wide at the base, widest of all on the shoulders, and narrowed on the sides to the apex; from some points of view they appear to form an irregular M. The prothorax appears to be scooped out, and with a few setae on each side of the middle in front, with the processes at the summit of the scooped-out parts not specially elevated or produced.

ONTHOPHAGUS FLAVOAPICALIS sp. nov.

♂ Black, shining, most parts with a distinct bronzy gloss, antennae, palpi, and tarsi reddish, club flavous; elytra with flavous mottlings about base and apex, or on apex only. Under-surface and legs rather sparsely clothed, a few submarginal setae on elytra.

Head with interocular ridge very feebly elevated and slightly curved; space between it and clypeal suture with rather sparse and small, but sharply defined punctures. Clypeus with crowded punctures, sides rather lightly elevated, apex distinctly notched, suture with median part almost straight, distinctly carinated, and equal to the two side parts. Eyes rather narrow, facets distinct. Prothorax with sides strongly and almost evenly rounded, front angles subacutely produced, hind ones widely rounded; sides very finely margined, apex still more finely, base not at all; median line feebly traceable at base and again near apex; punctures of small or medium size, and sharply defined, but not crowded, smaller and sparser in middle near apex than elsewhere; sublateral foveae rather small. Elytra with rather narrow geminate striae, with transverse distant punctures, interstices separately convex, faintly rugulose, with fairly numerous and rather small punctures, not very deep but quite distinct and becoming rather coarse on sides. Metasternum with fairly dense and large punctures, becoming sparser and mixed with small ones in middle. Apical segment of abdomen distinctly narrowed in middle; pygidium with dense and fairly large punctures. Length, 5–6 mm.

♀ Differs in having the interocular ridge even less distinct, prothorax smaller, less convex in front, and without trace of a median line except at extreme base, and apical segment of abdomen less narrowed in middle.

Hab. Western Australia: Geraldton (J. Clark). Type, I. 15415.

With the general appearance of *O. blackwoodensis* and *O. pontilis*, but head of male unarmed, *O. incornutus* has very different punctures on prothorax and elytra, etc.; *O. macleayi*, which is similarly coloured, is larger and with the sculpture of head and elytra different. The bronzy gloss is very faint on the elytra, and on two females the gloss there is slightly greenish. Each of the five specimens before me has distinct markings at the apex of elytra; on two of these the base is immaculate, on two (one of each sex) there is a spot inwards of each shoulder, and on the other (a small female) there is an obscure spot at the base of most of the interstices.

ONTHOPHAGUS CRIBRICOLLIS sp. nov.

Plate ix, fig. 77.

♂ Black, palpi and parts of tarsi reddish, antennae flavous, head (except clypeus and elevated parts, which are bronzy) and prothorax dark metallic green. Under-surface and legs sparsely hairy.

Head with dense, moderately large and sharply defined punctures, becoming transversely confluent or vermiculate on clypeus; interocular ridge wide, acute and even on top, but the sides abrupt, punctures behind ridge sparser than elsewhere; sides conspicuously angulate. Clypeus with oblique slightly elevated sides, apex strongly elevated and slightly notched, suture carinated throughout, median two-thirds almost straight. Eyes narrow, with distinct facets. Prothorax large, sides strongly rounded, front angles rather acute and produced slightly outwards, margins rather narrow throughout, with four obtuse elevations across middle about one-fourth from apex; punctures large and crowded, but nearly all round and sharply defined. Elytra with narrow striae containing distant transverse punctures, interstices shagreened and opaque, with small subobsolete punctures, becoming more distinct on sides. Metasternum with rather small and irregularly distributed punctures. Abdomen with apical segment strongly narrowed to middle. Front tibiae elongate. Length, 8 mm.

Hab. Northern Territory: Daly River (H. Wesselman). Type, I. 15419.

Apparently nearer to *O. conspicuus* than to any other species, but the opaque black elytra and coarse punctures of prothorax and head should be distinctive, even if the prothoracic tubercles should be variable, as they certainly are on that species. I know of no Australian species (except several of the *O. pentacanthus* group, in which in parts they are larger) with coarser punctures on the pro-

thorax; on *O. haagi* they are even denser, but are not as large; on *O. rugosus* the prothorax is much rougher, but the roughness is due to irregular elevations; on the present species it is due to punctures. The medio-frontal elevations of the prothorax are very feeble, especially the two median ones, which appear to be little more than irregular ridges between a few punctures; the median line is invisible from above, but from in front the prothorax appears to be vaguely depressed along the middle. In some lights, parts of the under-surface have a faint greenish or purplish gloss.

ONTHOPHAGUS CLYPEALIS sp. nov.

Plate ix, fig. 78.

♂ Black, shining, in parts with a slight bronzy gloss, antennae, palpi, and tarsi reddish, club paler. Under-surface, legs, pygidium, sides and apex of prothorax, and parts of head, with rusty-red hairs; elytra with a row of shorter and paler subdepressed hairs or setae on each interstice.

Head moderately large, with a rather short, subconical, and somewhat sloping horn near each eye; between the horns and the clypeal suture distinctly concave, and with rather small but distinct punctures. Clypeus with fairly numerous sharply defined punctures of moderate size, with larger setiferous ones scattered about; sides evenly rounded and slightly margined, the margins moderately elevated, becoming more elevated and almost truncated in front; suture trisinuate, median sinus carinated, arched forwards, and about once and one-third the width of each of the others, which are oblique. Eyes narrow, with distinct facets. Prothorax rather wide, front slightly retuse and with a feeble median lobe, sides and apex finely margined, base not; with rather sparse, sharply defined punctures, small in middle, and larger, but not coarse, elsewhere; median line vaguely defined. Elytra with narrow, geminate striae, containing rather distant, transverse punctures; interstices with irregular rows of fairly large, distant punctures. Metasternum with rather large, sharply defined punctures; near the coxae mixed with some smaller ones. Apical segment of abdomen distinctly narrowed to middle; pygidium with rather large and sparse punctures. Length, 7–8 mm.

♀ Differs in having the interocular horns reduced to slight prominences, connected by a feeble ridge, the concave space shallower and with coarser punctures; clypeus slightly notched in front, with denser punctures, its suture more elevated in middle; prothorax not retuse in front, without trace of a feeble median lobe, hairs not continuous across apex, and apical segment of abdomen not narrowed in middle.

Hab. Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15399.

I know of no closely allied species; the cephalic horns are placed somewhat

as on *O. mutatus*, but the space between them is conspicuously concave, and the elytral punctures are very different. On the male there are some obscurely reddish spots on the base, apex, and sides of the elytra, on the female on the apex only. The elytral punctures in places appear to be in irregular double rows, elsewhere in single rows, many of them have a granulated appearance, and each contains a seta; although the surface is not distinctly wrinkled it is slightly rugose, more noticeably on the female than on the male. The front tibiae do not appear to differ in the sexes.

ONTHOPHAGUS MICROTRICHIUS sp. nov.

♂ Black, shining, palpi and legs more or less reddish, antennae flavous. Under-surface and legs with sparse hair and short setae; elytra and sides of prothorax with sparse pubescence, or short depressed setae.

Head flat and almost impunctate between eyes, then with rather small sharply defined punctures to clypeal suture. Clypeus short, sides feebly elevated, more strongly so and almost truncated in front, with denser and larger punctures than on rest of head, and in places feebly confluent; suture strongly elevated and carinated in middle, its sides somewhat oblique and narrowly impressed. Eyes narrow, with distinct facets. Prothorax slightly wider than head, front angles obtusely produced, sides moderately margined, apex and base feebly so, the margin vanishing in middle of base; apical fifth or sixth vertical in middle, with two small, flat prominences above; median line shallow about base, and traceable to middle; punctures of moderate size, sharply defined and numerous, but not crowded, very small on retuse portion. Elytra with narrow, subgeminate striae, containing distinct punctures; interstices separately convex, with numerous somewhat rugose but sharply defined punctures, and in places briefly obliquely strigose. Metasternum opaque and with asperate punctures on sides, shining and with small punctures in middle. Apical segment of abdomen strongly narrowed in middle. Front tibiae rather long. Length, 6–7 mm.

♀ Differs in having a feeble bilobed elevation between the eyes, clypeus moderately notched in front, its suture less elevated in middle; prothorax smaller, not vertical in front, without medio-apical prominences; apical segment of abdomen scarcely narrowed in middle, and front tibiae shorter.

Hab. Queensland: Cape York (H. Elgner), Cairns (E. Allen). Type, I. 3783.

The general outlines are somewhat suggestive of *O. macleayi*, *O. queenslandicus*, and *O. comperei*, but the head is very different. The prothorax of the male, as seen from behind, appears to have the whole apex trisinuate, the median sinus smaller than the others. On several females the sides of the clypeus are obscurely reddish.

ONTHOPHAGUS VARIOLICOLLIS sp. nov.

Plate viii, fig. 60.

♂ Black, opaque, parts of tarsi, palpi, and base of antennae reddish, club paler.

Head wide, with a wide, thin, strongly curved horn near each eye, each horn with an obtuse projection on its outer side about the middle; punctures between horns and clypeal suture sparser than elsewhere. Clypeus with sides oblique and moderately elevated, apex more elevated and rather lightly notched; with dense asperate punctures; suture not carinated, median portion straight and rather feebly defined, the lateral parts oblique, their conjoint length about half of the total. Eyes rather large, facets inconspicuous. Prothorax with sides rather strongly rounded, front angles subacutely produced, sides with margins and gutters distinct, apex feebly margined, base not at all; with numerous large, round, shallow, but not crowded, punctures. Elytra with narrow striae, interstices feebly separately convex, and each with two irregular rows of small granules, except the first and sixth, which have but one row; suture subtuberculate at base. Metasternum and pygidium with punctures somewhat as on prothorax. Apical segment of abdomen almost vanishing in middle. Front tibiae long and strongly curved. Length, 8 mm.

Hab. North-western Australia: Wyndham (J. Clark, from W. Crawshaw). Type, I. 15420.

The upper-surface of the head and prothorax of the type is entirely bald, but the sculpture is of such a nature that this may be due to abrasion; on its under-surface and legs there are but sparse hairs and setae; the species is such an isolated one, however, that I have not hesitated to describe it. The curvature of the horns is somewhat as on *O. nodulifer*; *O. compercí* sometimes has the horns compound in the male, but both outwardly and inwardly its punctures and clypeus are also very different. The punctures on the head appear as if made with a pointed instrument forcing backwards a small portion of the derm when soft, so as to have a granulated appearance in front of the eyes, a transversely granulated appearance between them, and the clypeus to have numerous granules and small transverse ridges; the granules on the elytra are very distinct, and each has a setiferous puncture on its hind part, the setae very small and inconspicuous, even from the sides; on the prothorax the punctures are large and shallow, but well defined, from certain directions some of them appear to be crescentic.

ONTHOPHAGUS SEMIMETALLICUS sp. nov.

Plate ix, figs. 79, 80.

♂ Black, shining, head and prothorax with a more or less distinct bronzy gloss, antennae, palpi, and tarsi more or less reddish, club paler. Under-surface and legs rather sparsely clothed.

Head with interocular ridge depressed in middle, near each eye elevated as an obtusely triangular tubercle, punctures not very dense and rather small, more sharply defined on sides than elsewhere. Clypeus with sides oblique and scarcely elevated, but apex distinctly elevated and almost truncated; suture carinated and almost straight in middle, obliquely impressed on sides. Eyes narrow, with distinct facets. Prothorax with front angles subacutely produced, sides with narrow margins and gutters, apex and base very finely margined; apical fourth sloping and with a shallow depression behind each cephalic tubercle; with numerous but not crowded, and rather small, but sharply defined punctures, smaller on medio-apical prominence than elsewhere. Elytra with very narrow striae, interstices separately convex and with minute punctures, but with a row of large punctures on each side. Metasternum with large, irregularly distributed punctures, becoming very small in middle, except at base. Apical segment of abdomen strongly narrowed in middle; pygidium with rather dense, asperate punctures. Length, 4·5–6 mm.

♀ Differs in having the interocular elevations smaller, punctures before clypeus denser and more sharply defined, clypeus with sides more rounded, apex distinctly notched and less elevated, surface closely transversely vermiculate, and suture carinated on sides; prothorax with slightly larger punctures, frontal impressions more feeble or altogether absent; apical segment of abdomen not narrowed in middle, and front tibiae slightly stouter.

Hab. Queensland: Bowen, Bogie River, Leichhardt Downs (Aug. Simson). Type, I. 15411.

In general appearance extremely close to *O. zietzi*, but clypeus of male not conspicuously notched; the male in many respects resembles some females of *O. mutatus*, but may be at once distinguished by the front half of the head; some of the small specimens resemble *O. koebelei*, but that species has much larger eyes, with inconspicuous facets; large specimens somewhat resemble *O. fletcheri*, but are readily distinguished by the clypeus; they also resemble *O. microtrichius* and *O. frenchi*, but have much smaller punctures, and the head differently sculptured. On several specimens the legs are almost entirely reddish. The seriate punctures on the elytra are rather large, but are so placed that each appears to be cut into two by the elytral striae. Apparently the only certain external indication of sex is in the apical segment of abdomen, as one small male has the clypeus scarcely

more upturned in front than on the female, its surface obsoletely vermiculate, and prothorax with the frontal impressions very feeble; a still smaller male is obscurely reddish, with a vague greenish gloss on the head and prothorax, the interocular elevations feeble, clypeus as on the preceding male, and frontal impressions of prothorax absent.

ONTHOPHAGUS CUPREOPUNCTATUS sp. nov.

♂ Black, with a greenish gloss, becoming purplish or bronzy on head, antennae, palpi, and tarsi somewhat reddish, club somewhat piceous, with greyish pubescence. Under-surface and legs rather sparsely clothed.

Head with interocular ridge obtuse in middle, each side appearing as an obtuse subtriangular elevation; in middle a fairly large round fovea, a few conspicuous punctures in front of eyes. Clypeus with sides gently rounded and moderately upcurved, apex moderately notched; with fairly dense, sharply defined punctures in front, becoming feeble posteriorly; suture not traceable across middle, but distinct on sides. Eyes very narrow, facets distinct. Prothorax moderately wide, evenly convex, lateral gutters and margins narrow, apical margin very narrow, basal absent; punctures nowhere crowded, but more numerous on sides than elsewhere, and rather small but sharply defined. Elytra with narrow, geminate striae; interstices not separately convex, with fairly numerous, small punctures, becoming larger on sides. Metasternum with fairly large punctures on sides and apex, becoming sparse and small in middle. Abdomen with apical segment distinctly narrowed in middle; pygidium with rather dense punctures. Length, 4·5–5 mm.

♀ Differs in having the head with denser and coarser punctures, especially on clypeus, interocular ridge very feeble, even on sides, median fovea shallower, clypeal suture carinated throughout, the median portion straight and about three-fourths of the total; prothoracic and elytral punctures somewhat larger; apical segment of abdomen not narrowed in middle, and front tibiae distinctly shorter, with stouter teeth.

Hab. New South Wales. Type, I. 15421.

I have seen specimens of this species named as *O. nitidior*, but they differ from that species in being smaller, with the gloss mostly greenish instead of purplish, and both sexes concave between the eyes; the size, colours, and general outlines are somewhat as on *O. negatorius*, but the head, elytra, and legs are all very different. The prothoracic punctures in some lights have a distinct coppery-purple gloss.

ONTHOPHAGUS BICARINATICEPS sp. nov.

♂ Black, elytra castaneous, antennae, palpi, and tarsi reddish, club piceous, with greyish pubescence. Under-surface and legs sparsely clothed; upper-surface with sparse, erect setae, shorter and less erect on elytra than elsewhere.

Head with interocular ridge narrow, straight in middle, curved near each eye; behind it (except at base, which is impunctate) and at the sides with fairly large punctures, between it and clypeal suture with somewhat smaller and more crowded ones. Clypeus with sides and apex moderately upturned, the apex rather lightly emarginate; surface with dense and rather small, but sharply defined punctures, interspersed with large ones; suture in three parts, the median part carinated, curved slightly forwards, and three-fourths of the total. Eyes very narrow, with distinct facets. Prothorax rather large, evenly convex, sides with narrow gutters and margins, apex and base very finely margined; with fairly numerous, sharply defined punctures of moderate size. Elytra with narrow geminate striae containing distant punctures, which impinge on interstices; interstices separately convex, with irregular rows of distinct, distant punctures, becoming larger on sides. Metasternum with dense and fairly large punctures at sides and margining coxae, becoming sparse and small in middle. Abdomen with apical segment strongly narrowed to middle; pygidium with somewhat crowded punctures. Length, 3–3·5 mm.

♀ Differs in having somewhat larger punctures, sides of clypeus less upturned, apical segment of abdomen not narrowed in middle, and front tibiae somewhat shorter and stouter.

Hab. New South Wales. Type, I. 15408.

The minute size, bicarinated head, clypeus emarginate in front, and dark club associate this species with the description of *O. granum*, but the smallest specimen is 3 mm., the elytra are more or less reddish and have distinct punctures on the interstices, the prothoracic punctures could hardly be regarded as coarse, although not very small, and the upper-surface is not glabrous; from *O. imponderosus* it differs in the clothing of the upper-surface, prothorax entirely black and with larger punctures, and elytral interstices separately convex; the cephalic ridges are somewhat as on *O. koebelei*, but the two species are otherwise very different. On the type male the head and prothorax have a bronzy gloss, on the type female greenish. Two females from Queensland (Cairns, Dr. J. F. Illingworth) have the head and prothorax purplish, the legs obscurely reddish, and the elytra vaguely infuscated about base and suture.

ONTHOPHAGUS SUTILISTRIATUS sp. nov.

♂ Black, head and prothorax with a slight metallic gloss, antennae, palpi,

and parts of legs reddish, club deeply infuscated. Under-surface and legs moderately clothed.

Head with interocular ridge very feeble and arched slightly backwards; between it and base with very minute punctures, between it and clypeus with fairly dense and sharply defined but rather small ones. Clypeus large, sides moderately elevated, apex slightly more elevated and almost truncated; punctures somewhat larger and more crowded on sides than elsewhere; suture in three parts, the median distinctly carinated, arched slightly forwards, and about three-fifths of total, side parts less distinctly carinated, and oblique. Eyes narrow and with distinct facets. Prothorax large, somewhat gibbous in front, sides strongly rounded, front angles produced slightly outwards, lateral margins and gutters moderate, apical ones slight, base almost immarginate; punctures of moderate size and sharply defined, although not deep, smaller and sparser about apex than elsewhere; lateral foveae fairly large and deep; median line very faint, but traceable almost throughout. Elytra with narrow shining striae, containing small, distant punctures; interstices shagreened, subopaque, feebly separately convex, and with very small punctures. Metasternum with irregularly distributed punctures, becoming sparse and small in middle. Abdomen with apical segment strongly narrowed in middle; pygidium with fairly dense but rather shallow punctures. Length, 8 mm.

Hab. Queensland: Bowen (Aug. Simson). Type, I. 15404.

At first glance approaching some forms of *O. consentaneus*, but interocular ridge arched backwards instead of forwards, the space between it and clypeus, and the clypeus itself, considerably longer; in general it is extremely close to a female placed (apparently correctly so) with *O. mastersi* by Blackburn, but the clypeus is more elevated in front and the abdomen of the type is distinctly masculine; *O. promptus* and *O. margaretensis* are more metallic, and have the intercarinal space on head, and the clypeus considerably shorter. The elytral striae have the appearance as of bearing stitches at regular intervals.

ONTHOPHAGUS INTERRUPTUS sp. nov.

Plate ix, figs. 81, 82.

♂ Black, shining, head and prothorax with a slight bronzy gloss, antennae, palpi, and tarsi reddish, club flavous. Under-surface and legs with rather sparse clothing, but becoming dense on sides of sterna and parts of front legs.

Head wide, sides from near base almost semicircular, flat between eyes, except for short remnants of an interocular ridge; sides in front of eyes with a few punctures, but otherwise almost impunctate behind clypeus. Clypeus moderately elevated on sides, more strongly in front; with dense and fairly large

but shallow, subvermiculate punctures; suture carinated on sides, but obliterated in middle. Eyes large, facets inconspicuous. Prothorax large, sides strongly dilated in middle, then narrowed to apex, but with a sinuous outline, lateral margins and gutters comparatively wide, apical ones narrower, base almost immarginate, front angles obtusely produced, middle feebly produced; remnants of median line faintly visible; sides and apex with small, obsolete punctures, very minute ones elsewhere. Elytra with narrow, geminate striae, containing narrow, transverse, distant punctures; interstices shagreened, opaque, not separately convex, and with very minute punctures. Metasternum with dense, asperate, piliferous punctures on sides, running out at middle of apex, base with somewhat similar ones, middle shining and with minute punctures. Abdomen with apical segment strongly narrowed in middle; pygidium with numerous rather small punctures. Front tibiae elongate. Length, 10–10·5 mm.

♀ Differs in having the interocular ridge interrupted for a short distance only in middle, clypeus slightly notched in front, rather coarsely vermiculate, suture carinated across middle, prothorax evenly convex across apex, apical segment of abdomen not narrowed in middle, and front tibiae somewhat shorter.

Hab. Queensland: Bowen (Aug. Simson). Type, I. 15422.

With the general appearance of *O. glabratus*, *O. murchisoni*, and large *O. queenslandicus*, but readily distinguished therefrom by the interocular ridge and sides of prothorax; it is perhaps nearest of all to *O. pronus*, some specimens of which have the interocular ridge interrupted in the middle; it resembles several species of *Macropocopris*, but the claws are normal. On the female the clypeal suture is conspicuously carinated throughout, but each of the side parts, where it joins the median part, is attached to a carina that passes the front of an eye to join the outer end of the broken interocular ridge; on the male, owing to the absence of the median portion, the lateral parts appear to be suddenly directed backwards to the ends of the broken ridge. On both sexes the sides of the prothorax are not evenly rounded to the apex from their widest part, but have a slight (although quite distinct) incurvature between it and the apex; the front of the prothorax of the male could scarcely be regarded as retuse, but from behind it appears widely bisinuate.

ONTHOPHAGUS OPACIPENNIS sp. nov.

Plate vii, fig. 30.

♂ Black, antennae, palpi, and tarsi reddish. Under-surface and legs with long rusty-red hair.

Head large; interocular ridge semicircularly arched forwards, each end elevated into a rather long and almost upright thin horn; behind the ridge concave

and almost impunctate, between the ridge and clypeus with sparse and minute punctures, the sides with rather dense ones. Clypeus semicircular, sides feebly and evenly elevated; with dense punctures, transversely confluent or vermiculate, except at base, where they are sparsely and separately impressed; suture trisinuate and carinated throughout, median sinus slightly arched forwards, and about three-fifths of the total. Eyes moderately narrow, facets distinct. Prothorax large, sides strongly rounded and wider than elytra, front angles strongly produced and subacute, almost vertical and impunctate in front; the declivity crowned by four tubercles, the outer of these subconical and separated from the median ones by a shallow excavation, the median ones connected by a narrow ridge; median line wide and shallow, basal gutter shallower than latéral, and margin less elevated; with moderately large and dense, but not very deep punctures; sublateral foveae fairly deep. Elytra with narrow, geminate striae, containing transverse distant punctures; interstices shagreened and opaque, with small shallow punctures. Metasternum with dense, asperate punctures on sides, becoming larger and sparser about coxae, and small in middle. Apical segment of abdomen strongly narrowed to middle; pygidium shagreened and with fairly dense punctures. Length, 12–13 mm.

Hab. Queensland: Mount Tambourine, in October and December (H. Hacker), Blackall Range, in October (F. E. Wilson). Type, in Queensland Museum; cotype, I. 15437, in South Australian Museum.

A large species with prothoracic protuberances somewhat as in *O. pugnax,* but readily distinguished from that and all other large species by the interocular ridge and horns.

ONTHOPHAGUS STENOCERUS sp. nov.

♂ Black or blackish, in parts with a faint bronzy gloss. Antennae, palpi, and tarsi reddish. Under-surface and legs with rusty-red hair.

Head large; with a long thin erect horn near each eye, the two without a connecting ridge; from base to clypeus with sparse and minute punctures, but becoming fairly large and dense on sides. Clypeus almost semicircular, sides slightly elevated, apex rather higher than sides; with fairly dense punctures at sides, but smaller and sparser in middle; suture trisinuate, and carinated throughout, median sinus slightly arched forwards, and about three-fifths of the total. Eyes large, facets inconspicuous. Prothorax wide, sides strongly rounded, front angles strongly produced, lateral margins and gutters conspicuous, front ones feeble, basal absent; apical half obliquely sloping, and with sparse and minute punctures, elsewhere with slightly larger ones; sublateral foveae rather shallow. Elytra with narrow, geminate striae containing small distant punctures; inter-

stices shagreened and subopaque, with small, inconspicuous punctures. Metasternum with dense, asperate punctures on sides, sparse and small in middle. Abdomen with apical segment almost vanishing in middle; pygidium shagreened, opaque, and with fairly dense, small punctures. Length, 10–12 mm.

♀ Differs in having no horns on the head, the space between the eyes flat and marked in front by a straight carina-like edging, between this and the clypeus with larger punctures, although not very dense; clypeus closely transversely vermiculate almost throughout; prothorax less sloping in front, and with slightly larger punctures; apical segment of abdomen scarcely narrowed in middle, and front tibiae slightly shorter, with stouter teeth.

Hab. Queensland: Mount Tambourine and Brisbane (H. Hacker). Type, in Queensland Museum; cotype, female, I. 15438, in South Australian Museum.

Of other species with two long and more or less erect interocular horns in the male it is distinguished (apart from other features) by having much larger eyes than *O. tweedensis*, *O. australis*, *O. anisocerus*, and *O. mastersi*; *O. picipennis* has a strongly elevated ridge between the horns, and very different prothorax, *O. fitzroyensis* is considerably smaller, more metallic, with the prothorax as well as the elytra shagreened, and with somewhat larger punctures; the other species are all very much smaller. The largest female is almost entirely of a dingy reddish-brown.

ONTHOPHAGUS PHOENICOCERUS sp. nov.

♂ Black, most parts with a bronzy gloss, antennae (except club, which is blackish), tips of palpi, and tarsi of a more or less dingy red. Under-surface and legs with long, whitish hair.

Head with a wide, flat, bifid horn between eyes; with dense and fairly large punctures. Clypeus with sides moderately elevated, middle more strongly elevated and deeply notched; suture distinct on sides but not traceable across middle. Eyes very narrow, with distinct facets. Prothorax with sides strongly rounded, front angles strongly produced and subacute, margins narrow on sides, still narrower at base and apex; apical third retuse; median line scarcely indicated; with crowded, sharply defined punctures, of moderate size and occasionally confluent. Elytra with narrow, shining, geminate striae, containing small, distant punctures; interstices shagreened, opaque, and with sparse, minute punctures. Metasternum with crowded, asperate punctures on sides, becoming larger and sparser about coxae, and minute in middle. Abdomen with apical segment strongly narrowed to middle; pygidium shagreened and opaque. Length, 7 mm.

Hab. Queensland: Brisbane, in November (H. Hacker). Type, in Queensland Museum.

At first glance apparently close to some forms of *O. haagi* (a species in which the interocular horn is very variable), but prothorax without medio-frontal projections, and elytra without granules or small tubercles on the interstices; the prothorax and elytra are sculptured much as on *O. adelaidae.* The process on the head of the type rises abruptly vertical, and with almost parallel sides, for a height about equal to half the distance between the eyes, its ends are then continued as narrow horns for rather more than one-third of the total height; there is a small node on its back part. From the sides the prothorax and elytra may be seen to have very short setae, but they are scarcely visible from most directions.

ONTHOPHAGUS COMPOSITUS sp. nov.

♂ Black, most parts with a slight bronzy gloss; antennae (club blackish), palpi, and tarsi of a more or less dingy red. Under-surface and legs with rusty-red hairs.

Head with crowded and sharply defined punctures of moderate size; a small conical horn near each eye. Clypeus with sides moderately elevated, apex obtusely notched, suture trisinuate and carinated throughout, median sinus almost straight and about three-fifths of the total. Eyes very narrow and with distinct facets. Prothorax with sides strongly rounded, front angles produced and acute, lateral margins narrow, front ones still narrower, basal absent; front somewhat gibbous; median line vaguely traceable near apex and at base; punctures and elytra as described in preceding species. Metasternum with dense, asperate punctures on sides, small, mixed with large ones, elsewhere. Abdomen with apical segment strongly narrowed in middle; pygidium shagreened and with dense punctures. Length, 7 mm.

Hab. Queensland: Stanthorpe (von Weildt). Type in Queensland Museum.

The sculpture of the prothorax and elytra approaches that of *O. adelaidae* and *O. phoenicocerus,* but the head is very different; the colour and cephalic horns are somewhat as in *O. granicollis,* but the prothorax is nongranulate; *O. spissicollis* has more rugosely sculptured prothorax and very different clypeus. On the sides of the elytra there are some very short setae, and none elsewhere, but the type may be partly abraded.

ONTHOPHAGUS SQUALIDUS sp. nov.

♂ Black, in parts with a faint bronzy gloss; antennae, palpi, and tarsi reddish. Under-surface and legs sparsely clothed.

Head with dense and moderately large, subasperate punctures; a shallow depression in middle. Clypeus with sides rather lightly elevated, apex distinctly notched, with a small process on each side of the notch; suture in three parts, median part carinated and straight, lateral parts ill-defined. Prothorax evenly convex, sides strongly rounded and finely margined, front still more finely margined, base not at all; median line scarcely traceable; punctures crowded but sharply defined. Elytra with narrow, geminate striae, containing small, distant punctures; interstices shagreened, opaque, and with numerous small, shining granules. Metasternum with irregularly distributed punctures of various sizes. Abdomen with apical segment somewhat narrowed in middle; pygidium shagreened and opaque. Length, 5·5–6 mm.

♀ Differs in having the clypeus granulate-punctate, apical segment of abdomen not narrowed in middle, and tibial teeth larger and more acute.

Hab. Queensland: National Park, in December (H. Hacker). Type, in Queensland Museum.

With the general appearance of very small specimens of *O. carteri*, but the granules appear to rise evenly (although not in regular rows) from the elytra, which are finely shagreened and non-setose; on *O. granulatus* and *O. planicollis* the granules on the elytra are mostly confined to single rows, and the head and prothorax are very different; on *O. granicollis* the prothorax is densely granulate, and the elytral granules are smaller and setiferous. On the female the legs and metasternum are of a dingy red, but this may be due to immaturity; the margins of its clypeus are more strongly elevated than on the male, and the process on each side of the median notch is more prominent, but the male appears to be old and worn.

ONTHOPHAGUS STRABONIS sp. nov.

♂ Black, shining, head and prothorax with a slight bronzy or bronzy-green gloss; antennae, palpi, and tarsi reddish, club blackish, but with grey pubescence. Under-surface and legs with rather sparse clothing.

Head with two obtusely triangular transverse elevations between eyes; between elevations and clypeal suture with rather small punctures, somewhat larger and more sharply defined on sides. Clypeus with sides slightly rounded and slightly elevated, apex scarcely more elevated and rather feebly notched; punctures sharply defined on sides, rather feeble about middle of base; suture not carinated, and feeble in middle, distinct on the sides. Eyes very narrow, with distinct facets. Prothorax moderately large, evenly convex, sides finely margined, apex and base still more finely; with numerous but not crowded, and sharply defined but rather small punctures. Elytra with fine geminate striae; interstices not separately convex, with rows of rather small but sharply defined

punctures, and larger ones cut across by striae. Metasternum with large punctures, becoming smaller but more sharply defined in middle. Abdomen with apical segment strongly narrowed in middle; pygidium with crowded and sharply defined punctures. Front tibiae rather long. Length, 4·5 mm.

Hab. Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15407.

Structurally near male of *O. quadripustulatus*, although cephalic armature not quite identical, but elytra with more distinct punctures and unspotted; from the male of *O. blackburni* it is distinguished by the noncarinated clypeal suture; the male of *O. sydneyensis*, also with the suture noncarinated, has the clypeus truncated in front and impunctate; *O. blackwoodensis* has much larger prothoracic punctures, head of male with one interocular elevation, etc. The front angles of the prothorax from above appear to be rather acute, but at right angles are seen to be almost rectangular.

ONTHOPHAGUS IMPONDEROSUS sp. nov.

♂ Black, in parts with a slight bronzy or purplish gloss, legs and palpi reddish, antennae paler, sides of prothorax, most of elytra, and apical parts of abdomen obscurely reddish. Under-surface and legs sparsely clothed.

Head with a feebly elevated and almost straight ridge, almost touching the eyes; with small but rather distinct punctures behind it, and somewhat smaller, and sparser ones in front. Clypeus short, sides gently rounded and feebly upturned, middle feebly incurved and not more upturned than sides; punctures small and ill-defined, suture carinated and straight from side to side. Eyes narrow, with distinct facets. Prothorax wide and evenly convex, sides with narrow gutters and margins, apex more feebly margined, base scarcely visibly so; punctures of moderate size, numerous but not crowded, and sharply defined. Elytra with narrow striae; interstices not separately convex, with numerous small punctures, becoming larger on sides, where they are almost as distinct as those on prothorax. Metasternum with sharply defined punctures, larger on sides than elsewhere. Abdomen with apical segment distinctly narrowed in middle; pygidium with slightly larger and more crowded punctures than on prothorax. Length, 2·5 mm.

♀ Differs in having slightly larger punctures and apical segment of abdomen not narrowed in middle.

Hab. Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15409.

Smaller than any other species in the Museum, and apparently the size of *O. granum*, but club not dark, and clypeus scarcely emarginate, even in the female. The female has the elytra, except for a large space about the scutellum,

obscurely reddish, but the reddish parts not sharply limited; on the male the reddish parts are still more obscure; they are also very obscure on the prothorax.

MACROPOCOPRIS KINGI Har. (Onthophagus).

In Arrow's table of the species of *Macropocopris*, *M. kingi* is distinguished from *M. parvus* by its "Metasternum unpunctured." This appears to be the case with specimens when greasy, but when clean the metasternum is seen to have fairly numerous asperate punctures on the episterna, some shallow ones tending to obliteration on the sides and near the coxae, and very small ones in middle, but the largest ones are much smaller than those of *M. parvus*.

MACROPOCOPRIS PARVUS Blanch. (Onthophagus).

Plate ix, figs. 83, 84.

Specimens identified by Blackburn as *O. parvus* and agreeing with Arrow's table are before me: they all have the elytra shining and with minute but rather sharply defined punctures on a non-shagreened surface. In addition to differences in the front legs and abdomen, the sexes may be distinguished by the clypeal suture; in the female this is carinated across the middle as well as on the sides; in the male it is not so carinated, and on some specimens can scarcely be even traced. Mr. Tindale obtained 11, 6, 4 and 3 specimens from the anal region of the common wallaby of Groote Eylandt, *Macropus agilis*; they were running around the anus and amongst the fur; the natives said they were always to be found there; he obtained but one other specimen in ordinary collecting, but the species is common in collections from Cape York to North-western Australia.

A female from Port George IV (North-western Australia) differs from the normal form in having the elytra finely shagreened, and with still more minute punctures, not at all sharply defined; but these do not warrant its being described as a distinct species.

MACROPOCOPRIS PERAMELINUS sp. nov.

Plate ix, fig. 85.

♂ Black, shining, antennae, palpi, and tarsi somewhat reddish. Undersurface and legs with irregularly distributed, rusty-red hairs.

Head wide, sides from widest part almost semicircular and moderately elevated, more strongly so in front; obliquely flattened and almost impunctate between eyes, but with a small central fovea, with numerous small punctures elsewhere, becoming larger on clypeus, but nowhere very large. Clypeus with suture carinated on sides, but obsolete across middle, the side parts each joined

on to a thin carina that curves round to near the front of an eye. Eyes large, facets inconspicuous. Prothorax large, sides strongly rounded, lateral gutters fairly deep, margins fairly wide on sides, narrow at apex, but absent from base, front angles somewhat acute; a conspicuous conical tubercle in middle, crowning the summit of a fairly large, subapical depression; punctures very minute, becoming larger but obsolete in front angles. Elytra with narrow, geminate striae, containing narrow, distant punctures; interstices scarcely separately convex, and with minute punctures. Sides of prosternum, sides and base of metasternum, with rather dense piliferous, granulate punctures; metasternum with some large punctures near apex and small ones elsewhere. Abdomen with apical segment strongly narrowed in middle; pygidium with fairly dense small punctures. Claw-joints large, dilated to near apex, claws large and strongly arched at base. Length, 9 mm.

Hab. New South Wales: Wingham, one specimen from a bandicoot's nest (W. du Boulay). Type, I. 15396.

The general appearance is suggestive of species of *Onthophagus*, such as *O. glabratus* and *murchisoni*, with the prothorax armed, but the claw-joint and claws are those of *Macropocopris*; it is the only species at present known of that genus with the prothorax armed.

PEDARIA ALTERNATA sp. nov.

♂ Black, shining, most parts with a bronzy gloss; antennae, palpi, and tarsi more or less reddish. With short, pale setae, rather sparsely distributed.

Head wide, moderately convex between eyes; with rather sparse punctures becoming dense (but normally concealed) at base, sides flattened but with fine margins. Clypeus with two projections marking the sides of a semicircular notch. Prothorax widely transverse, front angles obtusely produced, hind ones obtuse, sides obliquely decreasing from near apex to base; a large, almost impunctate, medio-basal depression, its front angles obliquely produced, between depression and sides with large, rather dense and suboblong punctures, elsewhere with sparser, smaller, and more rounded ones. Elytra feebly dilated behind shoulders; with deep, sharply defined striae, four interstices on each elytron conspicuously wider than the others, and each with a row of rather distant, setiferous punctures. Metasternum with a large median depression, connected with mesosternum by a median ridge; sides with dense and large punctures, smaller elsewhere, but all sharply defined. Front tibiae moderately long, obtusely tridentate externally, apex with a rather strong inner hook. Length, 4·5–5 mm.

♀ Differs in being less parallel-sided; head smaller, with denser and rather coarse punctures; prothorax with denser and larger punctures, and with many

deep oblong ones in the large depression; front tibiae shorter, stouter, more dilated at apex, with larger and more acute teeth, and without an inner hook.

Hab. Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 15433.

Consistently larger and more metallic than *P. geminata*, prothoracic excavation with distinct punctures only in the female, elytra nongranulate, etc. Numerous specimens were obtained on the island.

EXPLANATION OF PLATES, vi–ix.

Plate vi.

Figs. 1, 2. *Canthonosoma macleayi* Har.
3, 4. *C. castelnaui* Har.
5. *Copraecus hemisphaericus* Guer.
6. *Labroma horrens* Sharp.
7. *Merodontus calcaratus* Macl.
8, 9. *Aulacopris reichei* White.
10, 11. *Coptodactyla ducalis* Blackb.

Plate vii.

Figs. 12–14. *Onthophagus laminatus* Macl.
15. *O. cowleyi* Blackb.
16. *O. pugnacior* Blackb.
17. *O. pugnax* Har.
18. *O. atrox* Har.
19, 20. *O. sloanei* Blackb.
21, 22. *O. fissiceps* Macl.
23, 24. *O. ferox* Har.
25, 26. *O. pentacanthus* Har.
27. *O. pronus* Er.
28, 29. *O. leai* Blackb.
30. *O. opacipennis* Lea.

Plate viii.

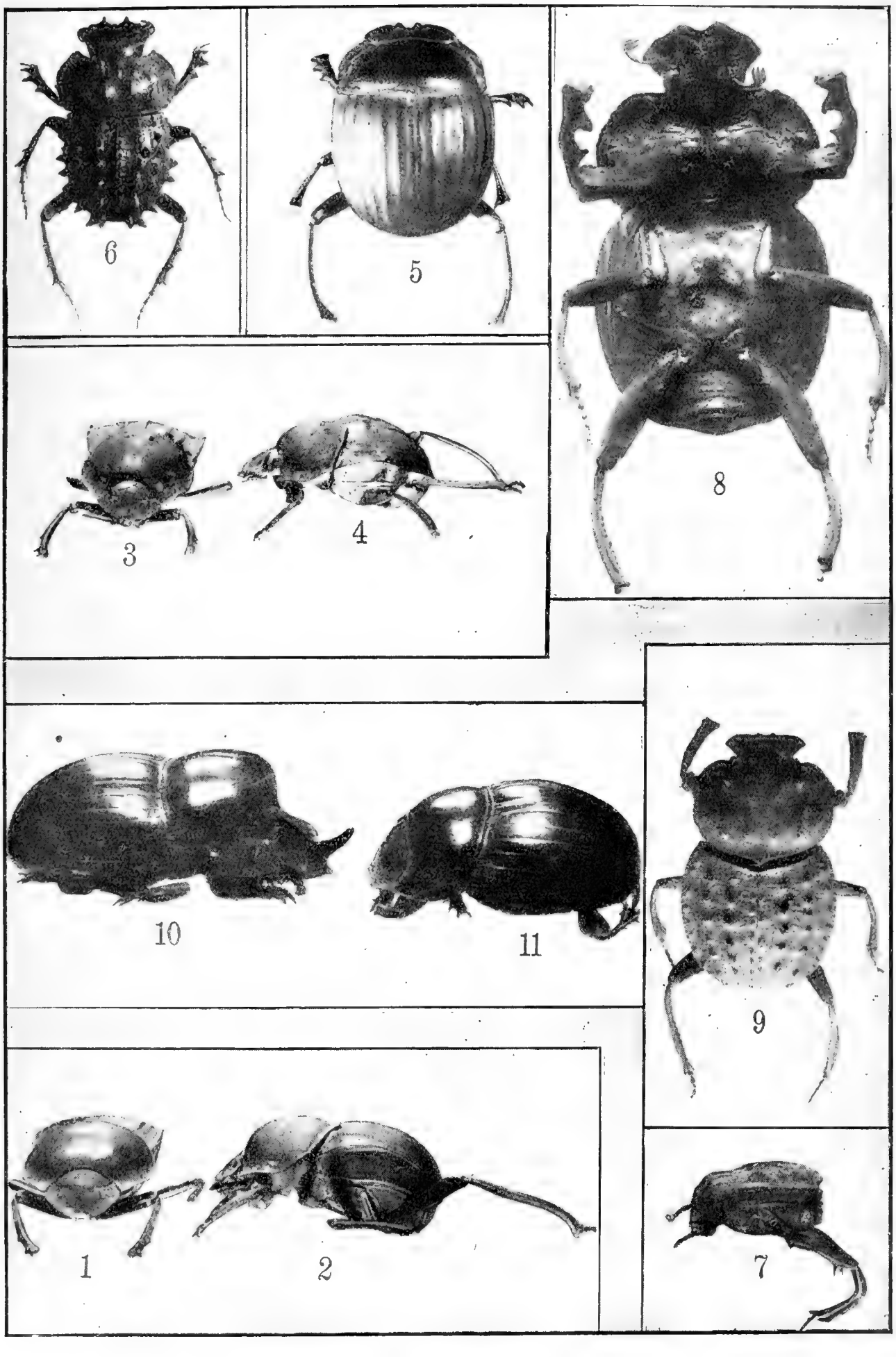
Figs. 31–33. *Onthophagus australis* Guer.
34, 35. *O. mastersi* Macl.
36, 37. *O. macrocephalus* Kirby
38, 39. *O. conspicuus* Macl.
40, 41. *O. nodulifer* Har.

42–44. *O. haagi* Har.
45–47. *O. anisocerus* Er.
48, 49. *O. tweedensis* Blackb.
50. *O. bovilli* Blackb.
51, 52. *O. victoriensis* Blackb.
53–56. *O. comperei* Blackb.
57, 58. *O. hoplocerus* Lea.
59. *O. bicavicollis* Lea.
60. *O. variolicollis* Lea.

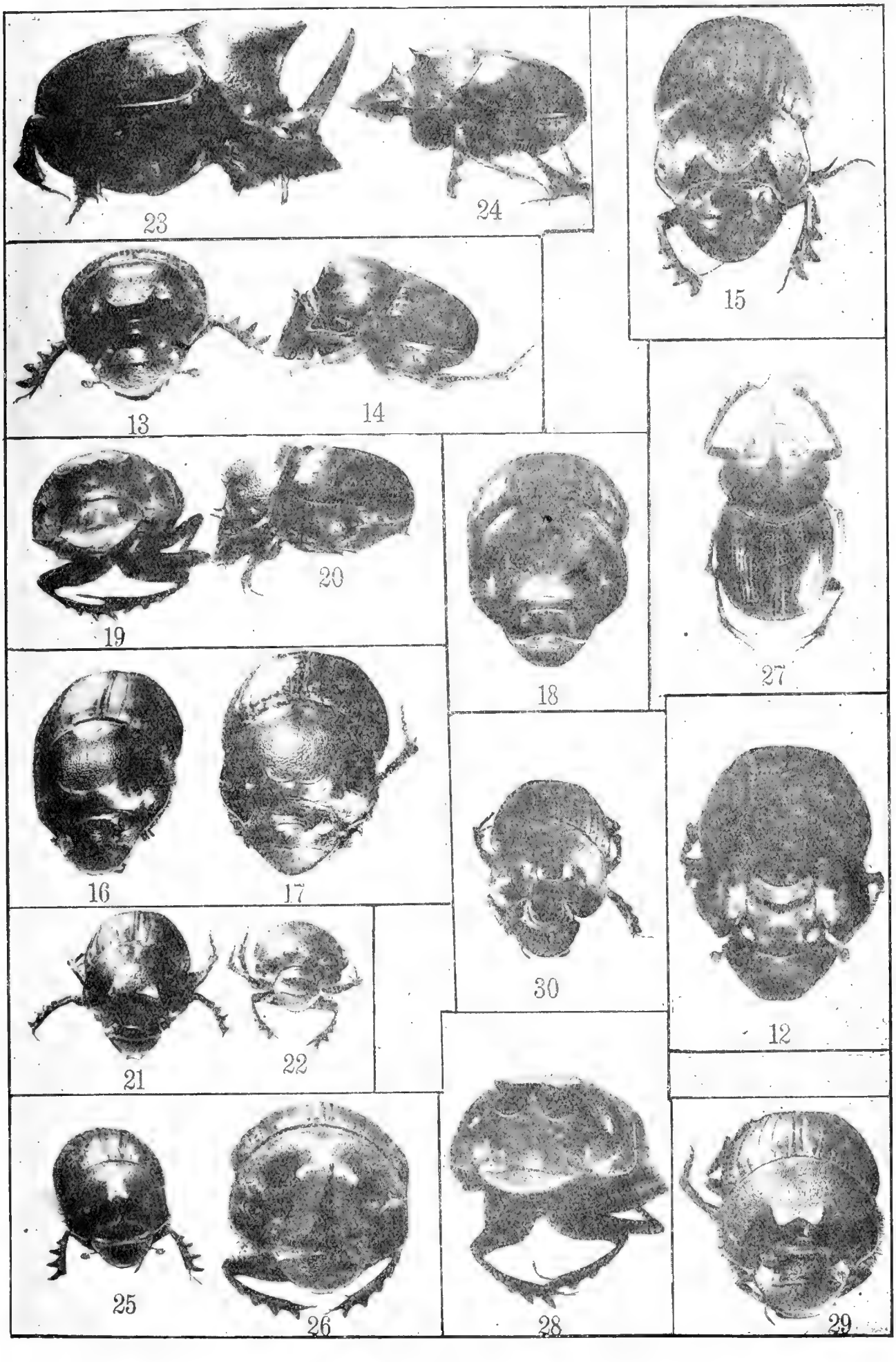
Plate ix.

Figs. 61, 62. *Onthophagus furcaticeps* Masters.
63. *O. lobicollis* Macl.
64, 65. *O. walteri* Macl.
66, 67. *O. cuniculus* Macl.
68, 69. *O. dunningi* Har.
70. *O. planicollis* Har.
71. *O. mamillatus* Lea.
72. *O. anchommatus* Lea.
73, 74. *O. tricavicollis* Lea.
75. *O. spissicollis* Lea.
76. *O. varianus* Lea.
77. *O. cribricollis* Lea.
78. *O. clypealis* Lea.
79, 80. *O. semimetallicus* Lea.
81, 82. *O. interruptus* Lea.
83, 84. *Macropocopris parvus* Blanch.
85. *M. peramelinus* Lea.

Photographs by N. B. Tindale.



AUSTRALIAN DUNG BEETLES



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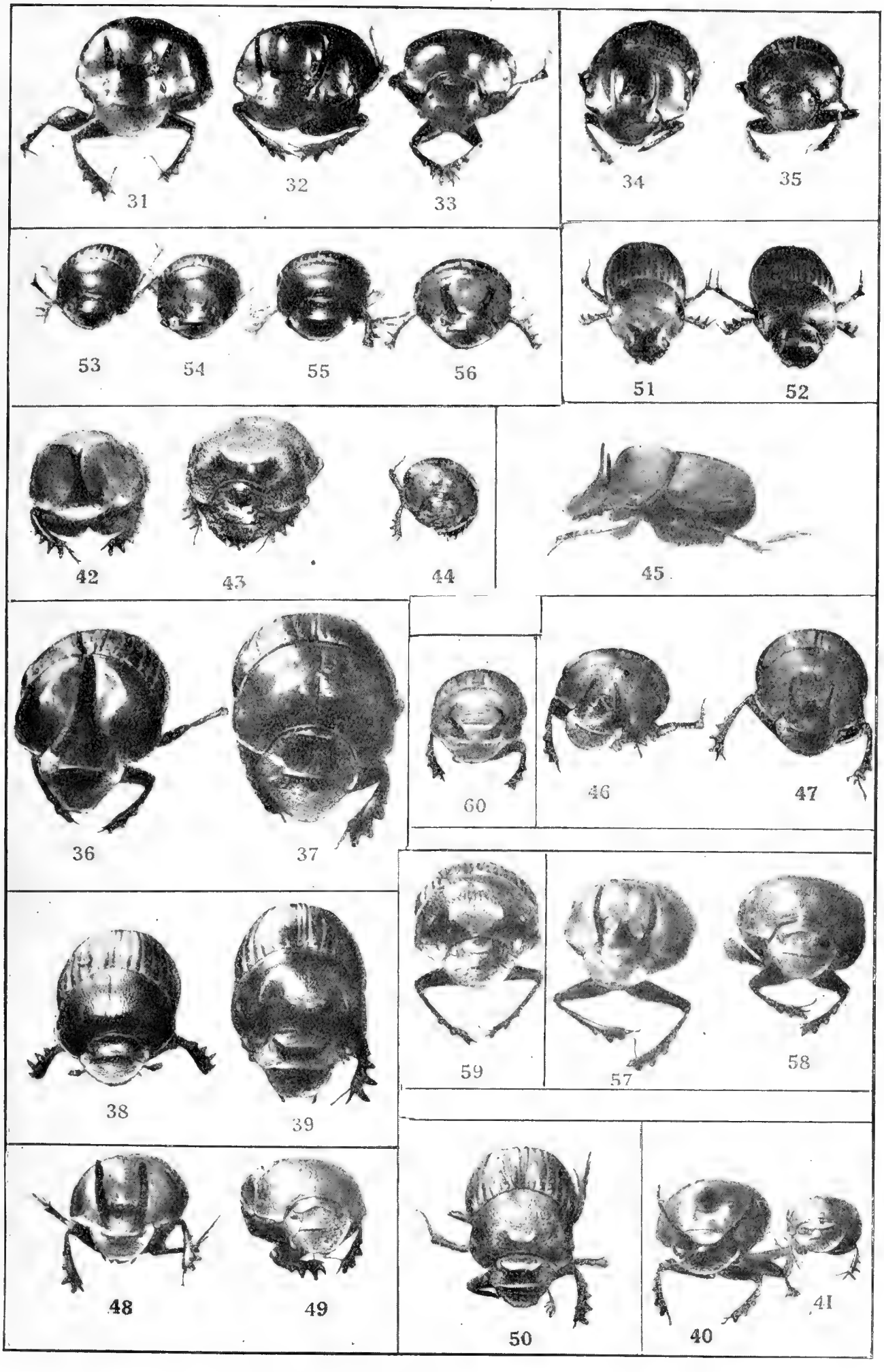

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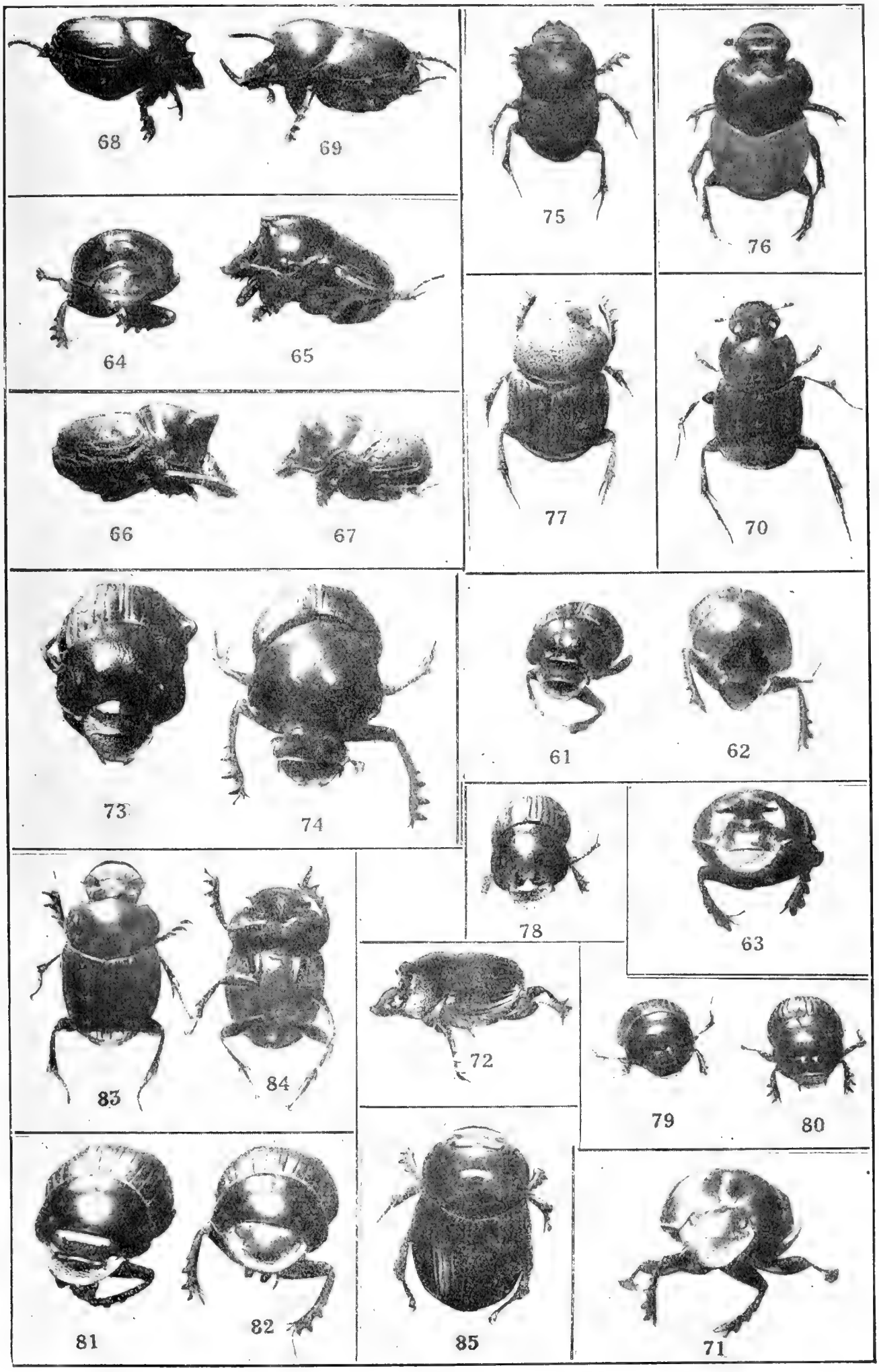


AUSTRALIAN DUNG BEETLES

STUDIES IN AUSTRALIAN AQUATIC HEMIPTERA.

No. II.

By HERBERT M. HALE, South Australian Museum.

Family NOTONECTIDAE.

Plates x-xi and Text fig. 361-373.

The salient characteristic of the bugs comprising this family is a curious habit of swimming with the venter uppermost, hence their popular name "back-swimmers." The underside of the abdomen has a median, longitudinal keel, with a trough on each side, over which guard hairs close and imprison the air which is utilized during submergence. The back is very convex longitudinally, so that the thorax is relatively deeper than in other aquatic forms. All the tarsi terminate in two claws and are usually two-jointed; in the male of *Anisops* the anterior tarsi have but one joint, and in the *Plea* herein described, both the anterior and intermediate tarsi are monomerous.

Four genera are recorded from Australia, but of these *Anisops* occurs far more commonly than the others, which are represented each by one species only.

Specific Characters. The general size of the head and the comparative width of the dorsal interocular space furnish useful and readily recognized characters in the determination of our species; in this connection the terminology given by Kirkaldy in his "Revision of the Notonectidae, No. 1" (1) is here adopted. The whole of the dorsal interocular surface is called by this author the "notocephalon," the term "vertex" is restricted in its usage to define the apparent anterior margin of the notocephalon, while the distance between the posterior angles of the eyes is aptly termed the "synthlipsis"; Kirkaldy later applied this word to a genus of Australian Mirid bugs. As a rule the inner margins of the large eyes diverge more or less from the base of the head and converge slightly towards the front of the notocephalon, so that the vertex is not actually the widest interocular space.

Colour is in most cases a character of little assistance; the notocephalon is ochraceous or testaceous in dried specimens, and the legs are generally of like colour, with parts of the inner or lower surfaces more or less dark brown to black. The species herein dealt with are structurally sufficiently distinct one from the other to be recognized with comparative ease.

Habits. All are eminently predatory, and our *Enithares* and *Anisops* are

(1) Kirkaldy, Trans. Ent. Soc., 1897, p. 393.

readily maintained in aquaria upon a diet of mosquito larvae. *Anisops* impartially inhabits running or stagnant water, clear or muddy. Examples taken from the River Murray lagoons, and others from Broken Hill, New South Wales, are at times infested with an Hydrachnid parasite, which also occurs on Corixids and water-beetles. Seldom more than one parasite is present on a small bug, whereas several are commonly attached to one beetle; the mite is usually fastened to the pronotum of the bugs, more rarely to an eye.

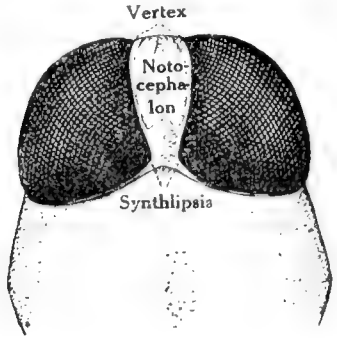


Fig. 361. Nomenclature of dorsal surface of head.

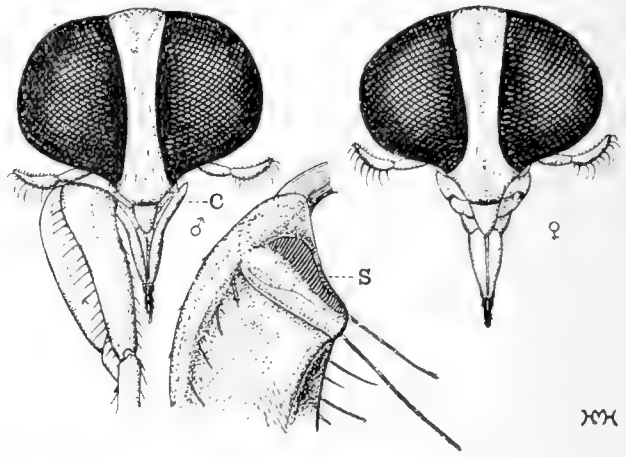


Fig. 362. Head of *Anisops hyperion* as seen from below: (c) chitinous prongs of beak; (s) femoral stridulatory comb.

With a view to determining in some measure the periods at which the various aquatic bugs occur at Adelaide, the ponds bordering the River Torrens were under observation during two successive years. In these situations the backswimmers disappeared at the end of the autumn, but Corixids were taken throughout the year, hibernating females being found amongst masses of *Nitella* and *Chara* in the cold months. On the other hand, in mid-winter many *Anisops*, including four species, were collected at Broken Hill from dams which had been almost or quite dry during the latter part of the summer.

The life history and biology of *Anisops* have not hitherto been recorded: an account of *Anisops hyperion* is given on page 405.

Excepting for the deposition of eggs, *Anisops* very rarely clings to plant stems, its poise in the water being almost perfect; *Enithares* commonly anchors itself to submerged objects (see pl. x, fig. 1), even walking up a plant stem to the surface for a renewal of its air supply.

Reproduction. From an examination of the gonapophyses of the females of six Australian species of *Anisops* it is evident that at least these members of the genus insert their eggs in plant tissues. The endophytic oviposition of *A. hyperion* was proved by actual experiment, and a comparison of the drilling gonapophyses of this species with the others figured on pl. xi will show that, without doubt, all serve a similar purpose.

The ovipositor is very similar in these six species and is of the same character in *Buenoa margaritacea*, the life history and biology of which have been dealt with by Prof. Hungerford.(2) This author also figures the drilling gonapophyses of several *Notonectae*, and while these show specific differences it is probable that throughout *Anisops* and *Buenoa* the ovipositor is of common form.

The ova of Notonectids are elongate, and if merely glued to plants are attached by the long axis; the eggs of Corixids are not elongate, are often peg-top shaped, and either pedicellate (as in *Arctocorisa mercenaria* and *Porocorixa eurynome*) or attached at the base to a gelatinous pad (pl. x, fig. 4, 5).

In *Anisops*, considerable dimorphism is exhibited between the sexes. The single-jointed anterior tarsi of the male terminate in curved, flattened and rather blunt claws, and the anterior tibiae are expanded basally on the inner surface to form a spur, on which is situated a stridulatory comb (fig. 362,s). The female differs from the male in having the anterior tarsi two-jointed, with sharper and more slender claws, while the form is usually more robust, the eyes slightly smaller, the notocephalon wider, and the pronotum a little shorter.

In the allied American genus, *Buenoa*, the male has a tibial spur quite similar to that of *Anisops*, and, in some species at least, a femoral area, on which the comb apparently operates. Hungerford describes and figures this apparatus, and mentions that, in addition, there are stridular areas on the face at the base of the beak. In the males of the Australian species of *Anisops* the femoral area is not apparent, but the rostrum is produced on each side to form a chitinous prong; when the anterior legs are folded, the position in which stridulation is effected, the apex of each prong is in juxtaposition with the tibial comb (fig. 362), so that it would seem that sound is produced by the rubbing of the combs on these rostral prongs; the beak is less markedly pronged in the male of *Buenoa*.

The genera at present known from Australia may be distinguished as follows:

a. Abdomen with a median, ventral carina; hemelytra overlapping posteriorly; legs dissimilar; eyes large . . . . . Sub-family Notonectinae.
  b. Anterior tarsi of male single-jointed . . *Anisops*.
  bb. Anterior tarsi of male two-jointed.
    c. Pronotum short, with the anterior angles excavate . . . . . *Enithares*.
    cc. Pronotum moderately long, the anterior angles not excavate . . . . . *Notonecta*.
aa. Abdomen without median, ventral carina; elytra not overlapping posteriorly; legs similar; eyes rather small . . . . . Sub-family Pleinae. *Plea*

(2) Hungerford, Bull. Univ. Kansas, xxi, 1919.

SUB-FAMILY NOTONECTINAE.

ANISOPS Spinola.

Anisops Spin., Ess. Hem., 1837, p. 58; Fieb., Rhynchotogr., 1851, p. 57; Stal., Hem. Afr., iii, 1865, p. 191; Kirk., Wien. ent. Zeit., xxiii, 1904, p. 111.

Type, *A. niveus* Fabricius.

This is the predominant Notonectid genus in Australia. The form is slender and the last antennal segment is longer than the penultimate segment, a condition reversed in *Notonecta*. When in the water the bugs appear silvery, with the venter dark.

KEY TO AUSTRALIAN SPECIES OF *ANISOPS*.

a. Head large, as wide, or almost as wide, as pronotum.
  b. Form slender; eyes of male almost touching at base of head.
    c. Male with a cephalic horn .. .. *fieberi.*
    cc. Male without cephalic horn .. .. *doris.*
  bb. Form robust; eyes well separated at base of head.
    d. Synthlipsis narrower than vertex.
      e. Pronotum of male long, a little wider than its length .. .. *hyperion.*
      ee. Pronotum short, twice as wide as long .. .. *ocularis.*
    dd. Synthlipsis about same width as vertex .. .. .. *endymion.*

aa. Head small, distinctly narrower than pronotum.
  f. Synthlipsis less than half vertex .. .. *gratus.*
  ff. Synthlipsis more than half vertex.
    g. Posterior margin of pronotum concavely incised; over 10 mm. in length .. .. *stali.*
    gg. Posterior margin of pronotum convex; less than 10 mm. in length .. .. *calcaratus.*

I know *A. endymion* only from the original description; Kirkaldy does not mention the comparative width of the head, so that its position in the above key is tentative. If it possesses a small head it should be placed with *A. stali* and *A. calcaratus*, from both of which it differs in the wider synthlipsis.

ANISOPS FIEBERI Kirkaldy.

Anisops fieberi Kirk., Entomologist, 1901, p. 5 & Wien. ent. Zeit., xxiii, 1904, p. 116.

Anisops niveus Fieb., Rhynchotogr., 1851, p. 60 (not Fabr.).

♂ Head, including eyes, about as wide as the pronotum; notocephalon produced outwards and downwards in front of eyes, the anterior margin truncate and slightly concave; interocular space with a narrow swelling on each side, not reaching to base of head and uniting towards front of cephalic projection; synthlipsis about 6 times in the distance between the anterior angles of the eyes; vertex 2 times in an eye. Pronotum 1·7 times wider than long, with a shallow, median depression outlined with some rather indistinct punctures; posterior margin concavely incised; lateral margins almost straight, slightly oblique. Scutellum large, as long as the pronotum, a little longer than wide. Anterior tibiae about 1·8 times as long as tarsi, which are nearly 2·5 times as long as the longest claw. Length, 7 mm.; breadth, 1·7 mm.

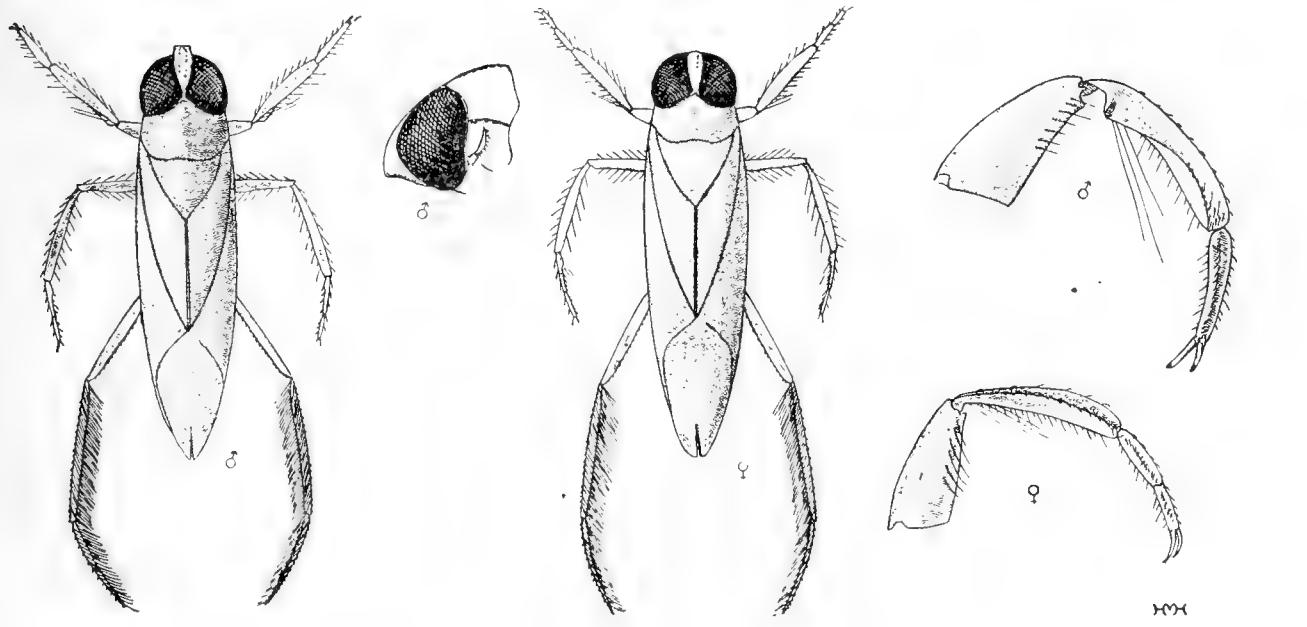


Fig. 363. *Anisops fieberi.*

♀ Vertex not produced in front of eyes; synthlipsis 2·5 to 3 times in vertex, which is 2·3 to 3 times in the width of an eye. Pronotum slightly shorter than in male. Anterior tibiae 1·5 times longer than tarsi, the second segment of which is half as long again as second. Length, 6·5 mm. to 7·2 mm.; width, 1·6 mm. to 1·8 mm.

Hab. Northern Territory: Darwin (G. F. Hill and W. K. Hunt). "Distributed over British India; Celebes" (Kirkaldy); "Ceylon" (Distant).

The colour of the specimens above described has faded to a dingy ochraceous, leaving underside of abdomen, eyes, and swimming hairs black.

ANISOPS DORIS Kirkaldy.

Anisops doris Kirk., Wien. ent. Zeit., xxiii, 1904, p. 112.

♂ Head, including eyes, nearly as wide, or slightly wider than, the pronotum; notocephalon white to yellow or testaceous, with a median groove, on

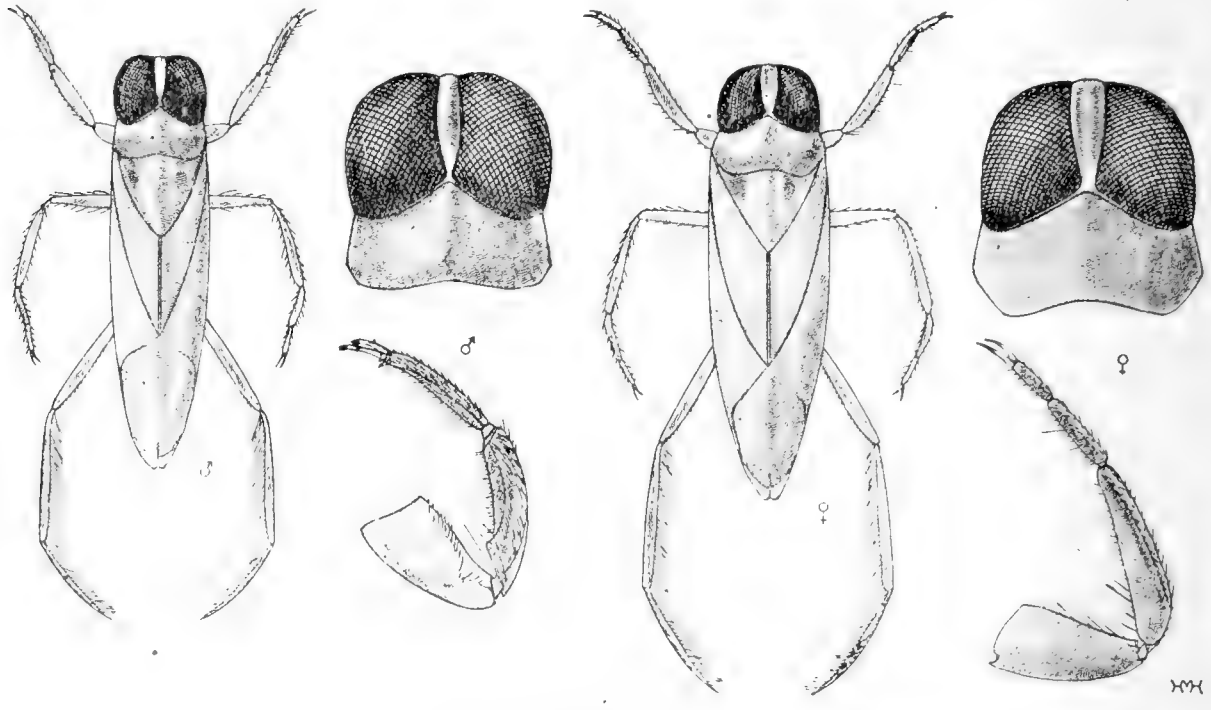


Fig. 364. *Anisops doris.*

each side of which is a narrow swelling, not reaching to base of head; vertex 2·3 to 3·5 in an eye, 3 to 6 times as wide as the narrow synthlipsis; eyes large and prominent, almost touching at base of head. Pronotum pale, smoky or yellow, sometimes darkened posteriorly; about twice as wide as long; superficially punctured; sides parallel or not very divergent. Scutellum pale yellow, bright orange or scarlet, usually with a more or less diffused, large, triangular, black spot on each side; about as wide as long, 1·5 times the length of the pronotum. Metanotum and upper side of abdomen yellowish, black, or testaceous marked with black. Underside black, with carina and lateral edges testaceous. Anterior tibiae 1·4 times the tarsi, which are 2 to 3 times as long as the longest claw. Length, 4·5 mm. to 8 mm.; width, 1·1 mm. to 2 mm. ("8½ mm.–9 mm." Kirk.).

♀ Form more robust, eyes not so large and always distinctly separated at base of head, and pronotum slightly wider, with the sides more divergent, than in male. Vertex twice, or more than twice, as wide as synthlipsis, which is 5 to 6 times in an eye. Length of second joint of anterior tarsus more than 1·5 times that of first. Length, 5 mm. to 9 mm.; width, 1·28 mm. to 2·2 mm. ("8 mm.–9¼ mm.," Kirk.).

Hab. South Australia: Adelaide, Murray Bridge, Port Willunga, and Northern Flinders Ranges, 2,000 ft. (H. M. Hale), Lucindale (B. A. Feuerheerdt), Mount Lofty Ranges (J. Formby, J. G. O. Tepper, and H. M. Hale), River Light (Molineaux), Myponga Swamps (A. H. Elston and H. M. Hale), Kangaroo Is. (B. B. Beck); Northern Territory: Alexandria (type locality); Queensland: Gladstone (A. M. Lea), Dalby (Mrs. F. H. Hobler), Karroongooloo Station (H. S. Allnutt); New South Wales: Sydney (W. B. Gurney), Mittagong and Tamworth (A. M. Lea), Broken Hill (F. W. Shepherd); Victoria: Melbourne (Searle), Coromby (J. G. O. Tepper); Tasmania (A. Simson).

The slender form, large eyes and narrow notocephalon are the salient features of this species. The synthlipsis of the male varies in width, but is always exceedingly narrow; the eyes are never actually contiguous basally, although in one instance they are separated by no more than the diameter of an eye facet; the vertex also varies in both sexes. The intermediate tibiae of the several specimens measured by me are relatively shorter than stated by Kirkaldy. A point worthy of note is the variability of size as compared with other Australian members of the genus with similar distribution; large and small specimens have been taken in company in the same localities. During trips to the northern districts of South Australia in 1920 and 1921 a few examples flew to camp lights at night, and others were collected in the clear brackish creeks.

In the spring of 1922 many thousands of backswimmers were congregated near the edges of a small dam in the Mount Lofty Ranges; two species were present in all stages, from egg to adult, most of the imagos having recently completed their metamorphoses. A census showed that *A. doris* occurred along one side of the pool, while *A. hyperion* was confined to the opposite margin.

ANISOPS HYPERION Kirkaldy.

Anisops hyperion Kirk., Wien. ent. Zeit., xvii, 1898, p. 141 & xxiii, 1904, p. 113 (part?).

♂ Head, including eyes, almost as wide as the pronotum; notocephalon ochraceous or testaceous, sometimes suffused at base with orange; with a median longitudinal groove, on each side of which is a swelling, which does not reach to base of head; vertex 1·4 to 1·9 times the synthlipsis, which is 3 to 4·5 times in the width of an eye; tumidities of notocephalon converging on clypeus to form a median carina, on each side of which, and bordering the eye, is a line of punctures. Pronotum pale anteriorly, usually blackish on posterior half, sometimes wholly black or wholly white; length a little less than four-fifths the humeral width; with shallow, scattered punctures and an indistinct, coarse median carina, which does not extend to the posterior margin; hinder edge concavely incised.

Scutellum anteriorly black, or with one or two black spots on each side; disc scarlet, orange or black, sides margined with yellow; wider than long, one-half to three-fourths the length of the pronotum. Metanotum and upper surface of abdomen (visible through wings) ranging from yellowish, varyingly marked with black, to black. Underside mostly black, with ventral carina and edges of segments pale testaceous. Legs ochraceous or testaceous; swimming hairs golden brown to black; anterior femora broad, on inner surface concave, the greatest width equal to half the length; anterior tibiae about one-third longer than tarsi, which are four times as long as the longer claw; intermediate femora one-fourth longer than the tibiae, which are more than one-third longer than tarsi; first segment of tarsus three-fourths longer than the other. Length, 7 mm. to 8 mm.; width, 2 mm. or a little more.

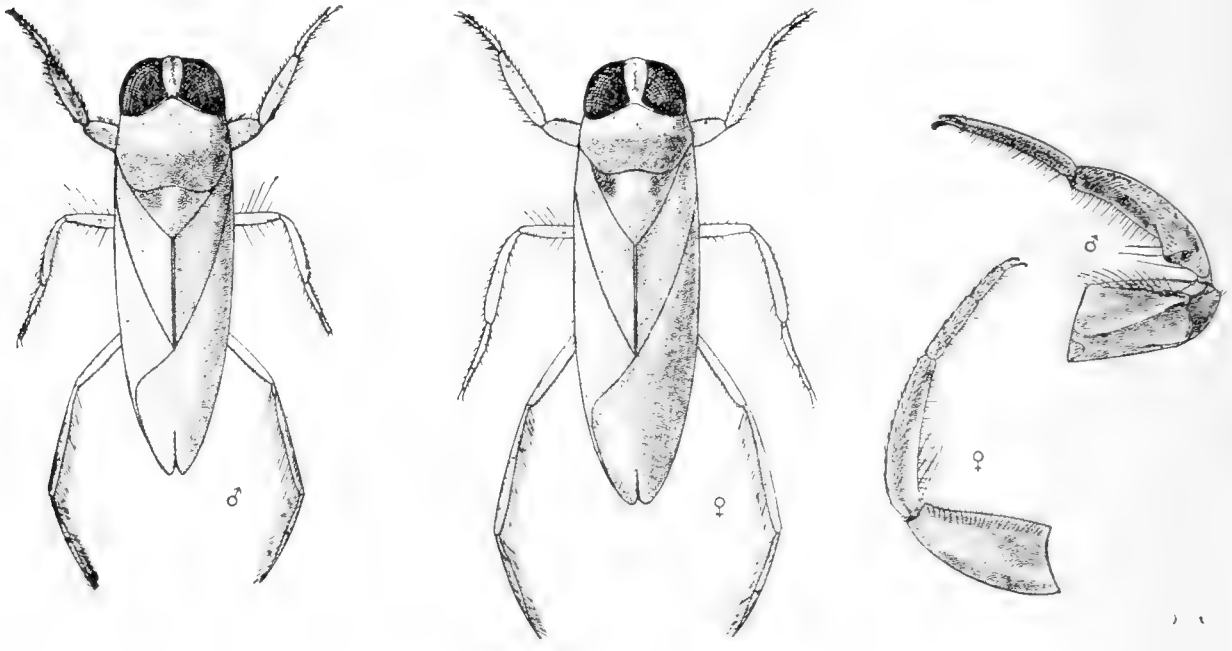


Fig. 365. *Anisops hyperion.*

♀ Pronotum a little wider than in male; vertex 1·5 to twice wider than synthlipsis, which is about three times in the width of an eye (less than four times in the type). Pronotum much shorter than in male, the length barely two-thirds the humeral width. Scutellum three-fourths of length, to about as long as the pronotum. Anterior femora not expanded, the greatest width (at base) being less than half the length; anterior tibiae about two-fifths longer than tarsi, the first segment of which is almost twice as long as the second. Intermediate tibiae less than one-fourth longer than tarsi. Length, 7 mm. to 8·6 mm.; width, 2 mm. to 2·5 mm.

Hab. South Australia: Adelaide, Mount Lofty Ranges, Port Willunga, Murray River and Northern Flinders Ranges, 2,000 ft. (H. M. Hale), Myponga

Swamps (A. H. Elston and H. M. Hale), Lucindale (B. A. Feuerheerdt), Beachport, South-Eastern districts (S. S. Stokes), Bordertown (J. G. O. Tepper), Baldina Creek (A. Zietz), Mount Parry (Tate); Queensland: Longreach (A. M. Lea), Rockhampton (type locality); New South Wales: Broken Hill (F. W. Shepherd); Victoria: (*fide* Kirkaldy); Western Australia: Mullewa (Miss J. F. May).

The specimens from Broken Hill are largely jet black, with the scarlet of the scutellum prominent.

This species superficially resembles *A. stali*, but may be easily recognized by the smaller size, larger head, and by the very different anterior legs. *A. hyperion* was originally described from female examples taken in Queensland; the proportions of the intermediate legs of the above specimens differ a little from those of the type, the tibiae being more than one-sixth longer than the tarsi. In the female the uncovered portion of the scutellum is rarely more than the length of the pronotum.

In his "Uber Notonectiden" (1904), Kirkaldy gives a short description of both sexes, and adds the following localities: Victoria (Kirk.'s collection); New Caledonia and Marianne Islds. (Paris Mus.); Viti Islds.: Ovalau.

He then expresses doubt as to whether he has not confused two species; the males described by him are 6 mm. to 7 mm. in length, with the anterior claws longer than in the males of the Australian species herein determined as *A. hyperion*; the examples recorded under this name from New Caledonia, etc., by Kirkaldy, and later by Distant(3) may prove to represent another species.

BIOLOGY AND LIFE HISTORY OF *ANISOPS HYPERION*.

A. hyperion is the commonest representative of the genus in South Australia, occurring in both running and stagnant water. As with other species of the genus, its poise in the water is almost perfect; after ascending to the surface, where the tip of the venter is exposed for a second or so, the bug darts down a few inches; slowly, however, it commences to rise, but a stroke of the swimming legs counteracts this buoyancy; gradually the tendency to automatically ascend becomes less marked, and finally the insect commences to slowly sink, so that a reverse movement is necessary to regain equilibrium until the surface is again visited. The bug, therefore, is never actually motionless in the water, but is continually jerking up and down, or down and up.

Food. The food consists of aquatic animals small enough to be mastered; for more than eight months examples confined in battery jars were maintained

(3) Dist., Nova Caledonia, Zool., i, 1914, p. 386.

upon mosquito larvae and pupae, both of which are captured with ease: indeed, the adults and, to a lesser degree, the fifth instar nymphs, appear to favour the pupae, for if such are present they are taken before the larvae. The victims are securely held beneath the comb-like bristles arming the margins of the anterior and intermediate legs, and are dexterously turned about as the beak is applied to fresh portions. The rapacity of the bugs is remarkable; unless unduly disturbed, examples which have captured a "wriggler" do not relinquish their prey when lifted out of the water during transit to another vessel.

Throughout the life cycle the nymphs also fed upon this diet; egg rafts of *Culex* were placed in the jars containing the hatching bugs, and the tiny emerging larvae were easily captured by the precocious nymphs. Between the second and final moults (a period of less than four weeks) isolated examples on an average each accounted for about 200 medium sized larvae, while during the first two stages many hundreds of newly-hatched larvae were eaten. A laying female during one month caught 33 large larvae and 37 pupae of *Scutomyia notoscripta.*

Breeding Habits. There are at least two generations every year, eggs being deposited as late in the season as April, the progeny wintering as adults and breeding the following summer. Copulation has been noted at the beginning of August.

With the object of recording the breeding and other habits of the species, examples hatched during the summer were installed in balanced aquaria towards the end of the season (April). Throughout the winter these bugs remained active and feeding. In early spring mating took place, and the first batch of larvae hatched on October 27th.

The courtship is most fascinating: the male, stridulating rapidly the while, poises below and a little behind the female, and in this position accompanies her every movement; finally, with the extended posterior legs quivering with excitement, he attempts to clasp her from below. He is not, however, in any way faithful to one consort, for if another female passes near, and the first has not responded, position is taken below the newcomer; if she proves more amenable a union is effected and the couple remain *in copula* for an hour or more; the male occupies a position below and slightly to the right side of the female (that is to the left, as the bugs are viewed upside down), the curious, finger-like anterior tarsal claws enabling him to maintain his embrace.

A description of the stridulatory apparatus of the male of *Anisops* is given in the introduction to this paper. When *A. hyperion* is stridulating the anterior legs are flexed still more than usual, the tarsi almost touching the body; the base of the tibia moves up and down over the rostral prong with extraordinary rapidity, and sometimes a tiny, silvery bubble may be seen at the point of

friction; the sound is often maintained for long periods; in mid-winter one example continued its song intermittently during the whole of one day, as is the case during breeding. Stridulation commences with a rapid series of squeaky notes, not loud, but continued for a minute or more; the notes then become slightly louder and more metallic, and finally merge into a shrill and loud chirrup, which is not sustained, the song soon sinking to *pianissimo* or ceasing altogether. When sitting near an aquarium containing stridulating *Anisops*, the effect is as of a distant grindstone at work, with the sound borne very faintly to the ear. Sometimes the characteristic chirrup is produced without the preliminary fainter notes, and *vice versa*, but in any case the stridulation is quite easily distinguished from the fewer and less quickly repeated notes of Corixids.

Oviposition. It has been mentioned that an examination of the female genitalia of the Australian species shows that all insert their eggs in plants. Some thick stems of *Potamogeton tricarinatus*, an indigenous water-plant, were anchored close to the glass of an aquarium containing some of the bugs under observation, and it was thus possible to watch the whole process of oviposition. The female grasps a stem with the anterior and middle legs and curves the abdomen so that its tip is almost touching the surface of the plant; the orifice opens and the point of the ventral carina explores the stem, the insect meanwhile walking down the support until a suitable site is selected. The genitalia are then extruded, the point of the abdominal keel is firmly applied and kept rigid, and quite close to it the drilling gonapophyses work at the stem with a circular, scraping motion; the epidermis is soon penetrated and an oval cavity is gouged out of the plant tissue. As the hole increases in size the tip of the carina slips into it at the lower edge (the insect being head-downwards), while all the time the drilling organs can be seen inside the semi-transparent stem, operating with a characteristic gouging movement.

When the hole is completed there is a short pause; then an egg is inserted, leaving a small portion of the anterior surface exposed at the mouth of the cavity. Finally the sensitive lip of the pygidium moves over and about the exposed portion of the egg, as if to make sure that all is well; the silky hairs of the posterior abdominal segments and ovipositor are doubtless to some extent tactile. The actual drilling of the *Potamogeton* tissue occupied from 35 to 50 seconds, the insertion of the ovum about 15 seconds. After an egg is laid the female swims away, vigorously cleaning the tip of the abdomen with the posterior legs and constantly exposing the genitalia while doing so. Oftentimes the female settles on a stem, explores the surface with the closed tip of the abdomen, and floats off again, as if dissatisfied with the location; if the ovipositor is extruded, however, one can be sure that, if not disturbed, the female will insert an egg

before leaving the stem. The bugs are shy during copulation and oviposition, and are rather easily disturbed in either act.

Period of Oviposition. In a jar containing one male and three females, the latter were simultaneously depositing eggs on November 1st; each laid only a few eggs a day, oviposition being most active after mid-day, when the sun was shining into the laboratory; at this time of day the male seemed greatly excited, frequently stridulating, poising beneath the females, and attempting to clasp them from below. On November 20th one of them, which had completed oviposition, was floating venter uppermost at the surface, apparently unable to maintain its poise, and shortly died; on this date the male was again *in copula* with one of the remaining females, both of which continued laying until about November 22nd, on which date the first of these nymphs hatched. The second female died on the 24th, and all weed was now removed from the vessel, so that the surviving female, which had not completed egg-laying, had perforce to cease ovipositing. The male perished on the 29th, but the female remained quite healthy for the following three weeks; at the expiration of this time a fragment of *Potamogeton* was dropped into the jar, and the interrupted oviposition was immediately continued, two eggs being laid in rapid succession. The survivor lived until the middle of January, 1923.

The Nidus. A plant stem or leaf of sufficient thickness to accommodate the eggs, and which the ovipositor is capable of drilling, is utilized if such be present; when indigenous *Potomogeton* and *Myriaphyllum* are growing in localities favoured by *Anisops* the stems of these plants are usually found to contain eggs.

As an experiment a gravid female was isolated in a jar containing only small plants of *Vallisneria spiralis*, the thin leaves of which are ill suited for the reception of the ova. A great number of slits in the leaves indicated abortive attempts to prepare suitable receptacles, and the eggs deposited in this nidus were but partially concealed, so that it was possible to photograph them *in situ* (pl. x, fig. 3–4).

Period of Development. About a fortnight after deposition the eggs exhibited the first traces of the red eye pigment of the enclosed embryo, and in another week the nymphs emerged. This period for incubation obtained with the water at a mean temperature of 67° F., but the time varies according to the temperature of the water and the season of the year; eggs deposited in December developed more rapidly, the eye-pigment appearing in a few days. The skin is moulted five times during the metamorphosis, the first four instars each occupying about a week, the fifth a little longer. In aquaria the individual variation in the periods between moults was as follows:—First, 7 days; second, 7-8 days;

third, 6-8 days; fourth, 7-10 days, and the fifth about 10 days. Thus the nymph attains maturity about two months after the egg is laid.

Habits of the Nymphs. The newly-hatched nymphs, as in the case of larvae of other Notonectid genera observed by Hungerford, are singularly helpless until the guard hairs have become charged with air; after tumbling about in awkward efforts to attain the surface film, they sink to the bottom exhausted. Several examples in this condition were placed in a small dish containing water to the depth of half an inch, and after three days none had filled its guard hairs; possibly during this period respiration was effected through the skin by osmotic action. They were then placed in a "balanced" aquarium containing ample weed, and next morning, with guard hairs filled, all were poised in the water, active and feeding. These first instar nymphs remain quite near the surface and behave much as do the imagos. In situations where *Anisops* is breeding, they do not mingle with the more developed examples, but congregate in the shallowest water at the margins of the pools, the shoals often comprising many thousands of individuals; adults do not appear to prey upon these swarming nymphs.

The moulting is not the least interesting phase of the metamorphosis: the skin splits along the dorsal median line of the thorax (where it is weakest), but the integument of the abdomen is unruptured; the skin of the head splits at the junctures of the eyes and notocephalon. The legs are drawn out of the previous sheaths, leaving the last-named, complete with swimming hairs, spines, etc., intact; the abandoned skin floats at the surface, a hollow replica of the nymph from which it is practical to compute leg and other measurements. Occasionally a nymph fails to rupture the skin and so dies; in an example which has perished thus the dorsum is characteristically humped owing to the abortive effort to burst the skin. After each moult the bug immediately expands to the proportions of the next instar.

Developmental Changes. The first instar nymph has no ventral carina on the abdomen and, even towards the end of the instar, very little pigment on the venter. The claws, as in the adult, are unequal, but are relatively much larger, decreasing regularly in proportion to the size as the bug grows; the posterior claws, for instance, are conspicuous in the first instar nymph, and measure one-fifth of the length of the tarsus, while in the adult they are small, hidden by the swimming hairs, and but one-tenth of the length of the tarsus. The anterior and intermediate tibiae and tarsi are concave on their inner surfaces as in the imago, but all the tarsi are single-jointed until after the final moult. The width of the synthlipsis in relation to that of the vertex does not differ greatly throughout the life history, but the eyes are at first small and the notocephalon is proportionally

much wider than in the imago. As successive instars are attained, the eyes become larger and more rounded.

Below is a description of each stage of the life history, following which is a table giving the average measurements of several specimens of each. The life history is illustrated on pl. xi, fig. 1 to 9.

The egg. Surface with small hexagonal reticulations. Colour pearly white when first laid, ochraceous, with red eye spots as development proceeds. Length, 1·32 mm.; widest diameter, ·52 mm., rather more as the enclosed bug attains larger proportions.

First instar nymph. Head somewhat conically produced in front of the small, widely separated eyes; vertex nearly twice as wide as the synthlipsis, which is one-third of the width of the head. Anterior and intermediate tarsi less than twice as long as the claws. (The longer claw of the pair terminating each tarsus is measured.) Lower edge of the posterior fulchra with a row of fine striae as in the adult. Swimming hairs rather sparse on posterior tarsus, almost absent on the tibiae. The colour is transparent whitish, with the eyes red, the guard hairs black, and the swimming hairs and a streak on the inner margin of the posterior tarsus dark brown. After the bug commences to feed the abdomen is dark owing to contained food, but as the instar draws to a close true pigmentation is slightly developed on the underside of the abdomen. Length, 1·8 to 1·9 mm.

Second instar nymph. Head less conically produced in front of the eyes than in previous instar; vertex slightly more than one and a half times the synthlipsis, which is three and a half times in the width of the head. A somewhat poorly developed ventral keel is now present, but the abdominal gutters are hardly apparent; the guard hairs are arranged as in the adult. A space on the venter between these is brown, and a faint dark streak appears on the underside of the posterior femora. Posterior femora, tibiae, and tarsi subequal in length. Anterior tarsi more than three times as long as claws, intermediate tarsi three times as long as claws. The swimming hairs on the posterior tarsi are denser, and a sparse fringe appears on the posterior tibiae. Length, 2·3 to 2·5 mm.

Third instar nymph. Head evenly rounded in front of eyes. Vertex about one and a half times the synthlipsis, which is one-fourth of the width of the head. The wing pads have appeared and extend past the first third of the thorax. Anterior and intermediate tarsi about three and a half times as long as their claws. Swimming fringes are developed on both margins of the posterior tibiae and tarsi. Limbs and under-surface in parts sooty; head ochraceous. Length, 3·2 and 3·56 mm.

Fourth instar nymph. Vertex about one and a half times the synthlipsis, which is 4·4 to 5·27 times in the width of the head. The wing pads extend to

beyond the middle of the length of the thorax. Anterior tarsi nearly four times longer than claws; intermediate tarsi more than four times longer than claws. Abdominal gutters now prominent. Pigment on venter of abdomen dark brown. Length, 4·12 to 4·5 mm.

Fifth instar nymph. Head much as in the adult, but notocephalon proportionally a little wider. The wing pads reach slightly beyond the posterior margin of the thorax. Anterior tarsi rather more than four times longer than the claws, intermediate tarsi more than four and a half times longer than claws. The pigment on the abdomen is almost black and the streak on the underside of the posterior femora is prominent; head and prothorax dark ochraceous.

In this instar the sex of each nymph can be determined, the immature males having the eyes more prominent, the notocephalon narrower, and the inner margins of the eyes rather less divergent, than in the other sex. Furthermore, by means of transmitted light, the two-jointed tarsi of developing females can be discerned through the integument of the single-jointed tarsi of nymphs nearing the final moult (pl. xi, fig. 9); similarly, the monomerous anterior tarsi and characteristic anterior tibiae of the male can be seen.

♂ Vertex, 1·34 to 1·8 times as wide as the synthlipsis, which is 4·5 to 6·8 times in the width of the head.

♀ Vertex, 1·35 to 1·5 times as wide as the synthlipsis, which is 3·4 to 4·6 times in the width of the head.

Length, 5·1 to 6·12 mm.

The imago. Newly moulted adults have a clear whitish appearance, with the underside of the abdomen brown; the scarlet of the scutellum and the dark colour on pronotum and dorsum of abdomen, etc., are developed later; the integument is at first soft, and the bugs shrivel if dried too soon after the metamorphosis is completed.

♂ Synthlipsis, 6·97 to 9·8 times in width of head.

♀ Synthlipsis, 6·1 to 8·0 times in width of head.

Other proportions are given in the general description of the species.

DIMENSIONS OF NYMPHS AND ADULTS.

Instar.	1	2	3	4	5	6 ♂	6 ♀
Total length	1·85	2·4	3·38	4·31	5·61	7·5	7·8
Greatest width	·6	·77	1·15	1·38	1·6	2·0	2·25
Width of head	·55	·7	1·0	1·14	1·48	1·7	1·78
Vertex	·33	·32	·37	·4	♂ ·417 ♀ ·53	·36	·425

Synthlipsis	·18	·2	·25	·26	♂ ·29 ♀ ·37	·22	·256
Anterior femur . .	·3	·35	·49	·65	·875	1·1	1·0
„ tibia	·4	·48	·63	·837	1·135	1·37	1·29
„ tarsus . .	·275	·33	·47	·6	·77	1·01	·93
Intermediate femur.	·425	·52	·79	1·1	1·365	1·7	1·72
„ tibia. .	·36	·45	·675	·875	1·13	1·33	1·39
„ tarsus.	·275	·34	·50	·625	·8	·97	1·02
Posterior femur . .	·65	·82	1·1	1·385	1·94	2·32	2·35
„ tibia. . . .	·68	·81	1·0	1·31	1·57	1·85	1·93
„ tarsus . . .	·8	·83	·95	1·165	1·307	1·34	1·46

ANISOPS OCULARIS sp. nov.

♂ Head, including the large and prominent eyes, very slightly narrower than the pronotum; notocephalon with a swelling on each side, not reaching to base of head, converging at vertex and continued as a median carina on to the very narrow face; synthlipsis about 1·5 in vertex, 5 times in the width of an eye. Pronotum pale testaceous; as long as the head, twice as wide as long, with a

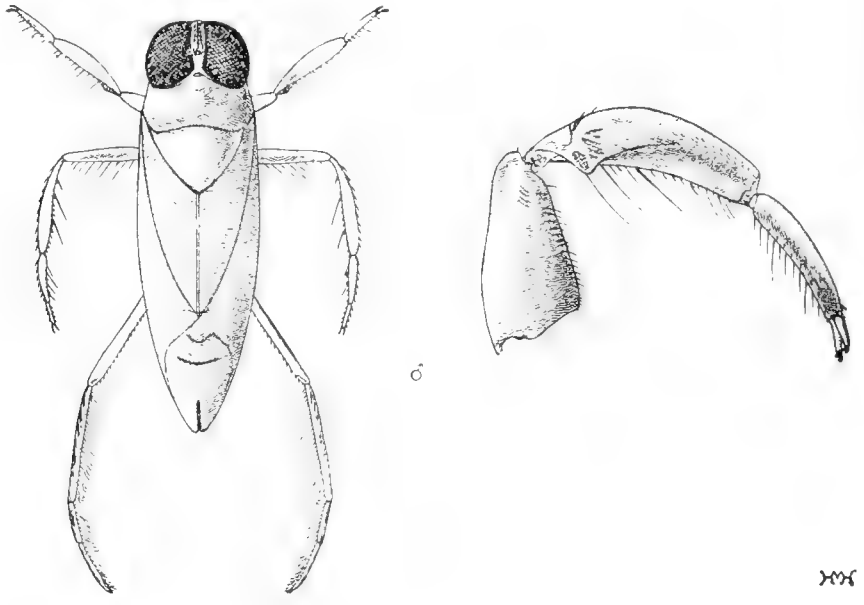


Fig. 366. *Anisops ocularis.*

feeble median carina, which disappears posteriorly; hinder edge slightly concavely incised. Scutellum testaceous, with a large, pale triangular patch near each anterior angle; wider than long, and about 1·25 times as long as the pronotum. Metanotum testaceous; upperside of abdomen pale, with the posterior segments in parts black. Underside of abdomen black, ventral carina and lateral edges ochraceous. Anterior tibiae much expanded, the greatest width (near the

base) being ·3 of the length; anterior tarsi 1·6 times in tibiae, 3 times longer than the longer claw. Length, 8 mm.; width, 2·5 mm.

Hab. Northern Territory: Darwin (W. K. Hunt).

The type is the only representative of this species before me. As in *A. doris*, the eyes are large, the notocephalon is narrow, and the pronotum is short; it differs, however, in the wider synthlipsis, the markedly more robust form, the much more expanded anterior tibiae of the male, etc. It resembles Distant's description and figure of *A. cleopatra* from New Caledonia, but in that species the synthlipsis is "not more than half" as wide as the vertex and the size is smaller.

ANISOPS GRATUS sp. nov.

♂ Head, including eyes, narrower than the pronotum; notocephalon with a median groove, on each side of which is a slight swelling; synthlipsis little more than 2 times in vertex, 5 times in the width of an eye. Pronotum almost one and a half times wider than long, with scattered punctures and a median fovea; posterior margin concavely incised, lateral margins divergent. Scutellum yellow, shorter than the pronotum; wider than long. Legs slender; anterior thigh 1·3 times tarsus; longer claw 2·5 in tarsus. Length, 7 mm. to 8·5 mm.; width, 2 mm. or slightly more.

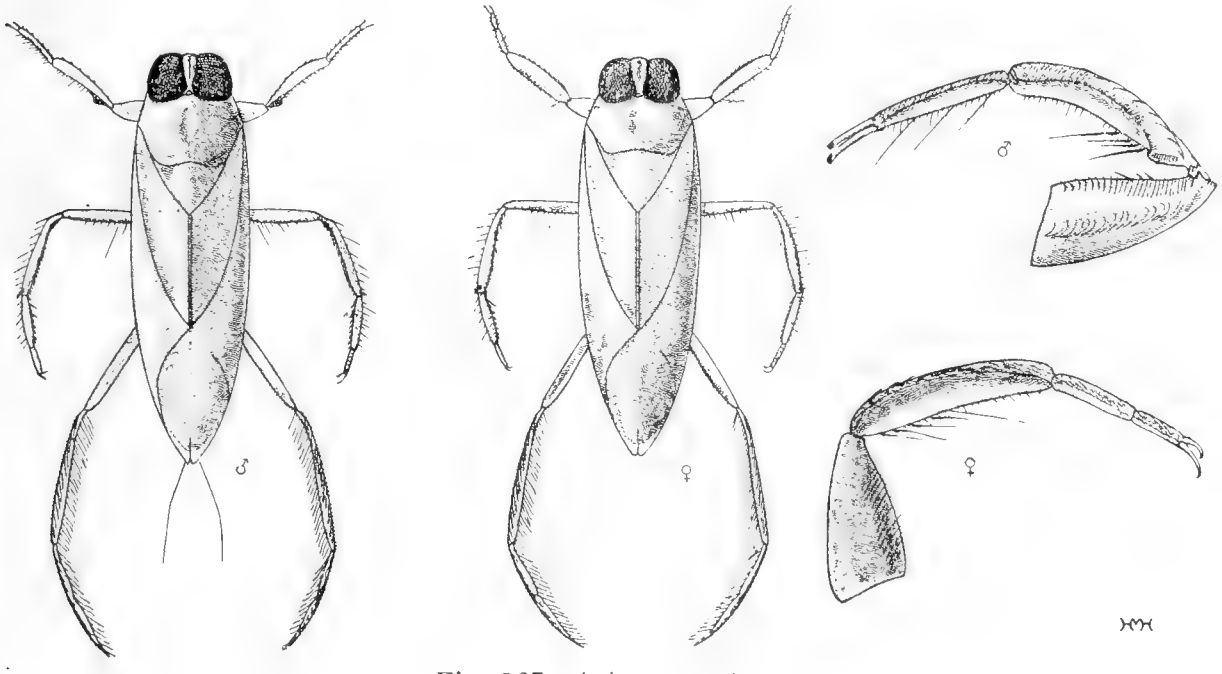


Fig. 367. *Anisops gratus.*

♀ Synthlipsis 2·5 to 3 in vertex, 4 to 5 times in the width of an eye. Pronotum a little shorter than in male. Scutellum about same length as pronotum, as wide as long. First joint of anterior tarsus almost twice as long as second; claws shorter than in male. Length, 7 mm. to 9 mm.; width, 2 mm. to 2·5 mm.

Hab. South Australia: Murray River (H. S. Copè), Adelaide and Port Willunga (H. M. Hale), Lucindale (B. A. Feuerheerdt), Bordertown (J. G. O. Tepper), Summertown (Pullman); Central Australia: Lake Callabonna (A. Zietz); Queensland: Karoongóoloo Station (H. S. Allnutt); New South Wales: Broken Hill (F. W. Shepherd, type locality); Western Australia: Mullewa (Miss J. F. May).

In this species the synthlipsis is narrower than in *A. hyperion, stali,* or *endymion*; a more robust form and smaller head at once separate it from *A. doris* and *fieberi.* The eyes of the male are occasionally much closer at the base of the head than in the type; in one example the synthlipsis is 4 times in the vertex and 10 times in the width of an eye. Although the synthlipsis varies thus, the vertex remains approximately the same, about 2·5 times in the width of an eye.

The delicate colours of *A. gratus* soon fade after death; the colouration of fresh samples collected by Mr. F. W. Shepherd in New South Wales, and by myself in South Australia, is as follows: Notocephalon very pale yellow, almost white. Pronotum orange, paler anteriorly. Scutellum clear lemon yellow, posteriorly suffused with orange. Metanotum and anterior part of upper side of abdomen (as seen through wings) clear lemon yellow, posteriorly delicately shaded with orange; sides of abdomen pale pink, the edges of segments shaded with brown; sternum yellow, underside of abdomen black, in parts yellow. Legs pale, coxae, femora, and tibiae marked with brownish-black on inner surfaces.

ANISOPS STALI Kirkaldy.

Notonecta australis Stal, Ofr. K.V.Ak. Forh., xii, 1855, p. 190 (nec. Oliv.).
Anisops australis Stal, Eugenies Resa, 1859, p. 267.
Anisops stali Kirk., Wien. ent. Zeit., xxiii, 1904, p. 113.

♂ Head, including eyes, much narrower than the pronotum; notocephalon ochraceous, produced downwards and slightly outwards in front of eyes, the anterior margin being truncate and a little concave, with a small projection at each angle; anterior three-fourths with a median, punctured groove, on each side of which is a swelling with an impressed line of punctures defining its outer margin; these tumidities converge anteriorly and meet in the middle of the front edge of the notocephalic projection; synthlipsis 1·3 to 1·5 times in the distance between the anterior angles of the eyes, and 2·3 to 2·5 in the width of an eye; face seen in profile, concave, so that the lower part of the eye projects in front of it on each side. Pronotum white, posteriorly black or reddish, about 1·5 times wider than long, with some indefinite punctures and an indistinct, coarse, median carina, which vanishes posteriorly; hinder margin concavely incised; lateral margins moderately oblique. Scutellum yellow or orange, anteriorly more

or less infuscated with red and sometimes with a small triangular black spot near each anterior angle; about as long as the pronotum. Metanotum and upper side of abdomen testaceous marked with black, or black. Underside of abdomen black, with ventral carina and edges of segments testaceous. Anterior tibiae 1·6 times longer than tarsi, which are more than twice as long as the claws. Length, 11 mm. to 12 mm.; width, 3·2 mm. to 3·5 mm.

♀ Vertex not produced as in male, projecting only very slightly in front of the eyes; swellings on notocephalon a little larger and converging on face, which, seen in profile, is almost straight; synthlipsis 1·3 to 1·5 in vertex, 2·1 to 2·5 in the width of an eye. Pronotum about 1·75 times wider than long. Scutellum longer than pronotum. Anterior tibiae 1·6 times longer than tarsi; first tarsal segment 1·5 times longer than second, which is little longer than a claw. Length, 10·5 mm. to 13 mm.; width, 3 mm. to 3·5 mm.

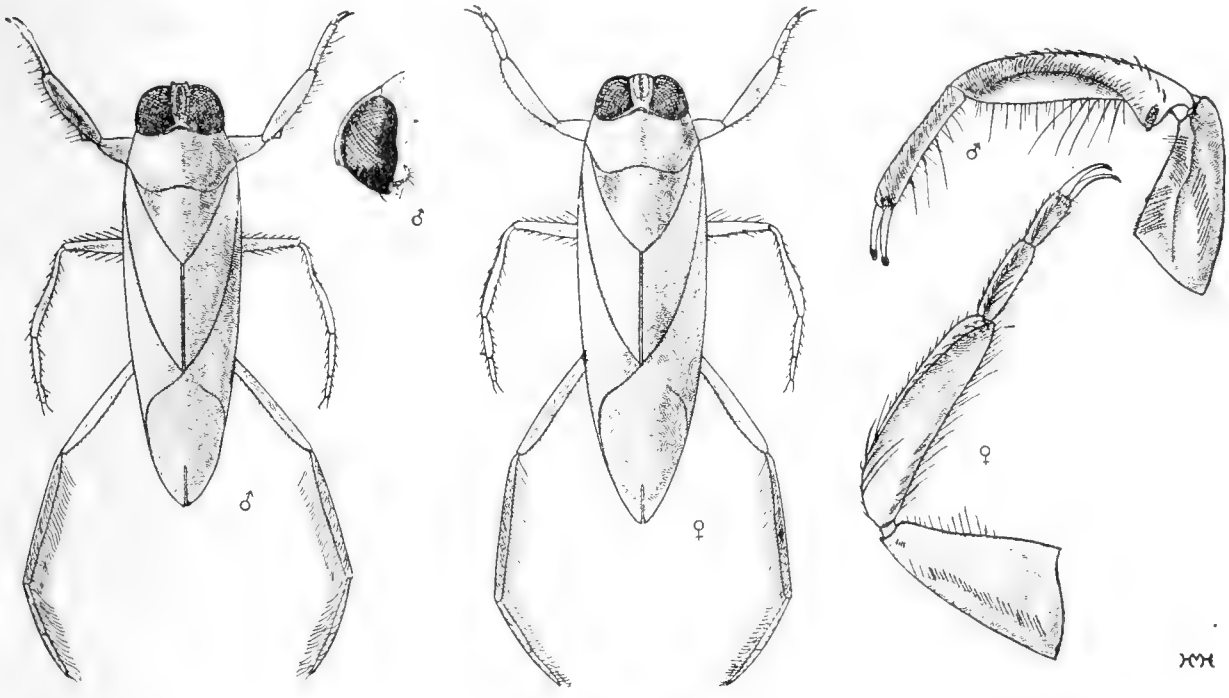


Fig. 368. *Anisops stali.*

Hab. South Australia: Murray River (H. M. Hale), "N.W. of South Aust." (Dr. H. Basedow), Bordertown (J. G. O. Tepper), Cordillo Downs (F. Archer; Central Australia: Cooper's Creek (J. G. Reuter), Boorgline Waterhole (Elder Expedition), Andamed Station (A. F. Roberts); Northern Territory: (Capt. S. A. White), Port Darwin; Queensland: Cunnamulla (H. Hardcastle), Karoongooloo Station (H. S. Allnutt); New South Wales: (type locality), Hay (A. M. Lea); Western Australia: Wyndham (S. Stephens).

This is the largest species recorded from Australia. Its form is robust, the body being deep and, seen sideways, considerably arched on the back, so that the

downward inclination of the head is rather more marked than in the other forms; the stout anterior legs are distinctive in their proportions. According to Kirkaldy's measurements, the intermediate tibia of the male is relatively shorter than in the female, but I can find little difference in the examples now examined.

ANISOPS CALCARATUS sp. nov.

♂ Head, including eyes, narrower than the pronotum; notocephalon with a median groove, which does not extend to hinder margin of the head and with a swelling on each side; synthlipsis less than 1·5 in vertex, 3·5 times in the width of an eye; notocephalic swellings uniting at the front of the head and continued on to face as a strong, median carina; eyes large, prominent, projecting slightly in front of vertex. Pronotum sordid testaceous, about 1·5 times wider than long, with a coarse, median carina reaching to posterior margin; lateral margins divergent; hinder edge evenly convex. Scutellum testaceous, wider than long, a little longer than the pronotum. Metanotum testaceous, with a black spot on each side; upper side of abdomen testaceous, posterior segments black. Anterior

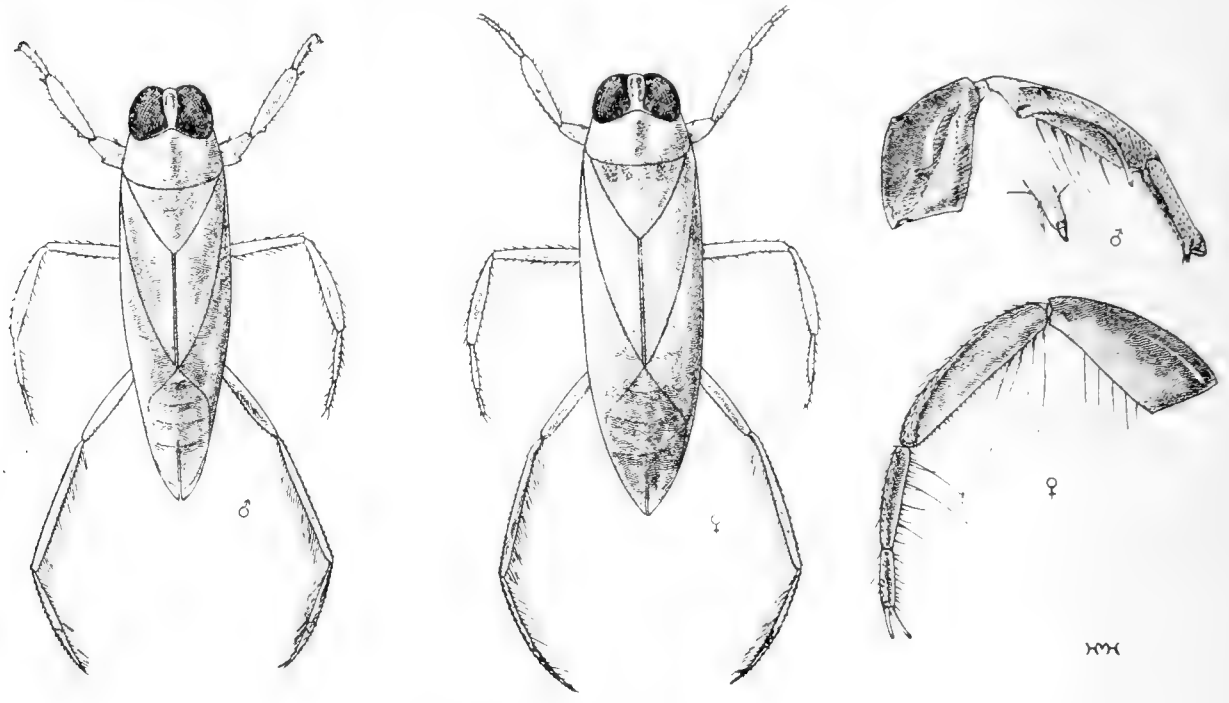


Fig. 369. *Anisops calcaratus.*

femora stout, the superior edge with a knife-like ridge, which gradually rises until it attains a point beyond the middle of the length of the thigh, where it abruptly terminates; summit of this ridge set with very small prostrate spines; tibiae strong, the anterior end of the inner face with a distinct spur, in the apex of which is set a short, stout spine; tarsi damaged. Length, nearly 9 mm.; width, 2·4 mm.

♀ Eyes not so prominent, and notocephalon wider than in male. Synthlipsis 1·5 in vertex, 3 times in the width of an eye. Pronotum about twice as wide as long, with a coarse, median carina; hinder margin convex. Scutellum pale yellow to orange; sometimes with a black spot on each side anteriorly; 1·5 times as long as the pronotum. Anterior femora not ridged on superior edge; anterior tibia one-fourth longer than the tarsi, the first tarsal segment nearly twice as long as the second, which is less than twice the length of the longest claw. Length, 8 mm. to 9·5 mm.; width, 2·5 mm. to 3 mm.

Hab. South Australia: Bordertown (J. G. O. Tepper, type locality); Queensland: Cunnamulla (H. Hardcastle).

The type, which is somewhat damaged, is the only male of this distinct species as yet received. The convex posterior margin of the pronotum distinguishes it from all other Australian forms, excepting possibly *A. endymion* Kirk.; in the description of the last-named species the character of the hinder edge of the pronotum is not stated, but the synthlipsis is described as about half the width of an eye and but slightly narrower than the vertex, while the pronotum is relatively longer and the scutellum shorter than in the female of *A. calcaratus*.

ANISOPS ENDYMION Kirkaldy.

Anisops endymion Kirk., Wien. ent. Zeit., xxiii, 1904, p. 114.

"Elytra ash-coloured, transparent. Posterior half of exocorium and the clavus smoke-coloured, anterior half of clavus, basal margin of corium and the basal half of exocorium, black. Veins of wings pale. Metanotum brownish-black, lateral margins pale. Legs pale. Abdomen above dull, pale, in the centre black. Below black. Crown longitudinally grooved, hardly broader on the anterior margin than on the synthlipsis, the breadth of the latter barely half the width of an eye.

Anterior margin of the pronotum between the eyes much more distorted than in other species (the distorted portion rounded anteriorly); pronotum three-fourths broader than its length, longer than the scutellum. Anterior and middle tibiae flat and laterally expanded, broader at end than at base; one-fifth times longer than tarsi, first tarsal segment two-fifths longer than the other, which is two and a half times as long as the claw. Length, 9 mm.; breadth, 3 mm.

Hab. Australia: Swan River (Perth Museum, Scotland).

Only a single female of this distinct species is before me."

I have not seen this species, and as the publication in which it is described is not included in our libraries a translation from the German of the original description is given above. *A. endymion* differs from the other species herein described in the wider notocephalon.

NOTONECTA Linnaeus.

Notonecta Linn., Syst. Nat., ed. x, 1758, p. 439; Fieb. Rhynchotogr., 1851, p. 48; Flor., Rhynch. Livl., i, 1860, p. 766; Saund., Hem. Heteropt. Brit. Is., 1892, p. 329; Kirk., Trans. Ent. Soc., 1897, p. 397.

Type, *N. glauca* Linnaeus.

Only one Australian species may be definitely assigned to this almost universally distributed genus; no *Notonectae* occurred amongst the considerable amount of material examined for the preparation of this paper.

NOTONECTA HANDLIRSCHI Kirkaldy.

Notonecta handlirschi Kirk., *loc. cit.*, p. 408.

Kirkaldy remarks: "Something like *N. americana* Fabr., but with the pattern and colour very obscure. I have very great pleasure in dedicating this species, the first true *Notonecta* from Australia, to Dr. Handlirsch, of the Vienna Museum."

Loc. "Australia." Type in Vienna Museum.

? NOTONECTA AUSTRALIS Olivier.

Notonecta australis Oliv., Encycl. Method., viii, 1811, p. 389.

Notonecta (? *Anisops*) *australis* Kirk., Trans. Ent. Soc., 1897, p. 426.

Kirkaldy, in his "Revision of the Notonectidae. Part I," was unable to trace this species, which he suggests may be an *Anisops*. Olivier's short description is practically confined to colour; in *Enithares bergrothi* the colouring is quite similar.

"Elle se trouve à la Nouvelle Hollande. Du cabinet de M. Bosc."

ENITHARES Spinola.

Enithares Spin., Ess. Hem., 1837, p. 60; Stal., Hem. Afr., iii, 1865, p. 190; Kirk., Wien. ent. Zeit., xxiii, 1904, p. 95.

Bothronotus Fieb., Rhynchotogr., 1851, p. 46.

Enithara Sign., Ann. Soc. Ent. Fr., (3), viii, 1860, p. 971.

Type, *E. indica*, Fabr.

Form robust; pronotum wide and short, with a foveate excavation at each anterior angle.

ENITHARES BERGROTHI Montandon.

Enithares bergrothi Montand., Rev. ent. franc., xi, 1892, p. 75; Kirk., Wien. ent. Zeit., xxiii, 1904, p. 105.

Enithara australica Signoret, Samml. (MS.).

?Bothronotus luniger Fieber, Abhand. der königl. böhm. Ges. der Wiss. (5), vii, 1852, p. 741. (White form.)

Plate x, fig. 1.

Notocephalon pale, basally wrinkled or punctate and with a low triangular tubercle at hinder margin; punctate on each side towards vertex, and with a line of punctures bordering each eye; vertex twice or a little more than twice as wide as synthlipsis, which is rather less than half the width of an eye. Pronotum black on posterior half, sometimes with the front edge broadly margined with black; foveate excavations ochraceous or black; about 2·5 times wider than long; anterior half densely punctured and finely wrinkled; posterior half smooth and

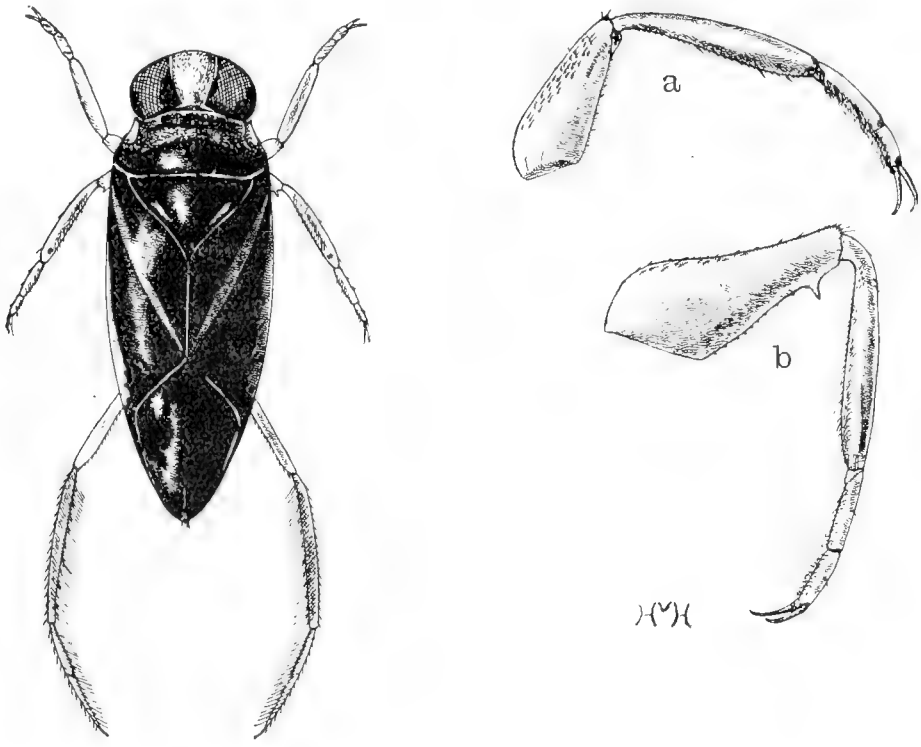


Fig. 370. *Enithares bergrothi;* a and b, anterior and intermediate legs.

polished, with a few small, scattered punctures. Scutellum pale or black, often with an oblique, ochraceous dash of varying shape on each side; about 1·5 times longer than pronotum, densely covered with fine punctures. Hemelytra black, sometimes paler laterally and on claval suture; clothed with tiny hairs; shining and densely covered with minute punctures. First joint of anterior tarsus about twice as long as the second; claws equal, as long as the second tarsal segment;

intermediate femora with a spur or tooth near the apex; intermediate tibiae about 1·5 times longer than the tarsi, the first segment of which is 1·5 times longer than the second; claws unequal, the longer one almost as long as the second tarsal segment. Length, 10 mm. to 12 mm.; width, 3·5 mm. to 4·5 mm.

Hab. South Australia: Adelaide, Mount Lofty Ranges, South-Eastern districts, etc., etc. (H. M. Hale), Myponga (A. H. Elston, etc.), Beachport (S. S. Stokes); Northern Australia (Belgium Museum, etc., *fide* Kirk.); Queensland: Kuranda (R. W. Armitage), Cape York (Belgium Museum, etc., *fide* Kirk.); New South Wales: Mittagong (A. M. Lea), Como (W. W. Froggatt); Victoria: Macedon, Melbourne and Plenty River (Searle), Melbourne, etc. (Paris, Stockholm, and Belgium Mus., etc., *fide* Kirk.); Eastern Australia and Tasmania (Paris Mus., *fide* Kirk.); Tasmania (A. Simson); Western Australia (Kirk., "meine Samml."); New Caledonia (type locality); Balade Is. (Paris Mus., *fide* Kirk.).

The colour is variable; pale examples confined in aquaria eventually became black, excepting for the head, legs, and part of the pronotum. The life colouring of a typical adult specimen is as follows:

Notocephalon gray, laterally margined with translucent yellow, posteriorly with a bluish-black triangular marking, the basal angles of which touch the inner posterior angles of the eyes; vertex suffused with bright, dark green (graminaceous); eyes dark rose; beak and face graminaceous, the last-named laterally margined with dark yellow. Pronotum black on posterior half, gray marked with black anteriorly, laterally tinged with green. Scutellum black, with a pale yellow dash on each side. Remainder of upper side black. Underside of abdomen black, with ventral carina and lateral edges graminaceous, and edges of segments castaneous. Upper surfaces of legs green, in parts tinged with yellow; lower surfaces dark green, more or less marked with brown; anterior femora with two dark brown streaks below and posterior femora with a dark brown stripe beneath; hairs brown.

In the living bug the black first appears in patches, which spread until the fine, uniform atrous colour is attained. For instance, on the scutellum a black median streak, or a black triangular patch with its base on the anterior margin of the scutellum, is first apparent; this patch grows larger until only a small pale dash is left on each side (fig. 370), and finally even these pale portions disappear.

This species is taken farther from the banks than is *Anisops*, and rarely congregates in large numbers, as do the last-named backswimmers. It has a habit of clinging to submerged objects or floating at the surface in deep water. Its food consists of any aquatic animal small enough to be mastered, and it has been

observed to capture and feed upon fifth instar nymphs of *Anisops*. The first nymphs of the season appear in early spring.

A resident in the Mount Lofty Ranges, who was recently stung as a result of incautiously handling one of these bugs, remarked that the effect was somewhat similar to that of a bee sting. The poisonous nature of the tiny wound was testified by the swollen condition of the punctured hand.

SUB-FAMILY PLEINAE.

PLEA Leach.

Plea Leach, Trans. Linn. Soc., xii, 1817, p. 11; Saund., Hem. Het. Brit. Is., 1892, p. 329; Kirk., Wien. ent. Zeit., xxiii, 1904, p. 126.

Ploa Stephens, Cat. Brit. Ins., ii, 1829, p. 354.

Ploca Doug. and Scott, Cat. Brit. Hem., 1876, p. 61.

Type, *P. minutissima* Fabr. (= *P. leachi* M'Gregor and Kirkaldy).(4)

Form stout, size small. Eyes widely separated and rostrum three-jointed. Inner edges of elytra meeting at the median line of the body.

PLEA BRUNNI Kirkaldy.

Plea brunni Kirk., Wien. ent. Zeit., xvii, 1898, p. 141, and xxiii, 1904, p. 128.

Notocephalon ochraceous, about twice as wide as an eye, closely punctate; face usually with a dark castaneous, central, longitudinal line, which is sometimes widened and diffused, sometimes with a dot on each side near vertex, and occasionally forked near vertex, forming a Y-shaped figure; hinder margin of head dark castaneous. Pronotum testaceous or ochraceous, often darkened near humeral angles; 1·3 times wider than its length; coarsely, reticulately punctate, but with a median, longitudinal portion very slightly raised, shining and not punctate. Scutellum dark testaceous or ochraceous, distinctly punctured, hardly half as long as the pronotum. Elytra of like colour, with brown, coarse, reticulate punctures. Wings well developed. Underside black; legs ochraceous; anterior tarsi less than half as long as tibiae; intermediate tarsi about half as long as tibiae; posterior tibiae 1·3 times longer than tarsi, the first joint of which is longer than second; posterior legs distinctly more ciliated than the others, with the claws strong and almost three-fourths of the length of the second tarsal segment. Length, 2 mm. to 2·4 mm.; width, 1 mm. to 1·4 mm.

Hab. South Australia: Murray Bridge and Mypònga Swamps (H. M. Hale); Northern Territory: Port Darwin; Queensland: Gladstone (A. M. Lea),

(4) Trans. Perthshire Soc., 1899, p. 5.

Cunnamulla (H. Hardcastle), Rockhampton (type locality); New South Wales: Clarence River (A. M. Lea); Tasmania: George Town; Western Australia: Albany (*fide* Kirk.); New Guinea (Mus. Genoa, *fide* Kirk.).

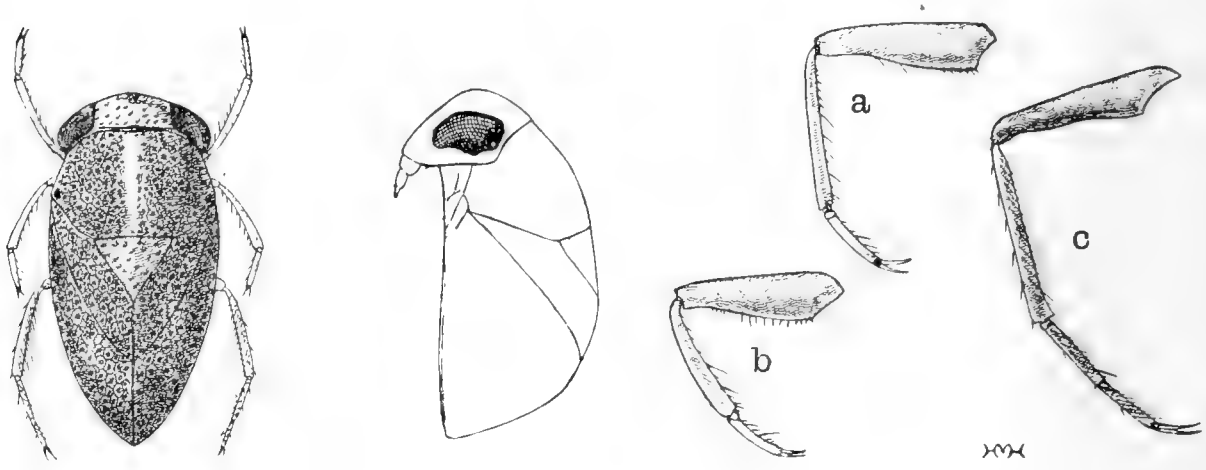


Fig. 371. *Plea brunni;* a, b and c, anterior, intermediate and posterior legs.

The examples from which the above description is made are provisionally referred to Kirkaldy's species; they agree well with the original description, excepting in the proportions of the intermediate legs. Kirkaldy writes: "Mittelschienen ein drittel langer als die Tarsen, erstes Tarsalsegment ein drittel langer als das zwiete."

These proportions apply to the *posterior* legs of the specimens before me, so, in preference to risking the creation of useless synonymy, I have regarded these limbs as the ones from which Kirkaldy's measurements were taken.

In the accompanying illustration of the insect, as seen from above, it will be noted that the pronotum, owing to its forward inclination, is foreshortened; its length can be more accurately gauged by a reference to the profile view.

A careful search for members of this genus in South Australia has resulted in the capture of the above species in two localities.

FAMILY CORIXIDAE.

(This publication, ii, 1922, p. 309.)

In addition to the asymmetrical abdomen, three other male characters are developed in several Corixid genera; these are the facial impression, the palal stridulatory comb, and the strigil, all of which are utilized during copulation, which is conducted underwater. Hungerford remarks that when *Arctocorisa* is *in copula*, "The pegs of the male palae make the embrace more secure, while the

peculiar structure called the strigil, upon the right side of the abdomen, without doubt serves a similar purpose.'' (5)

The accompanying drawing (fig. 372) shows the apparent function of the large facial impression of *Arctocorisa truncatipala* during copulation; the male clasps the female with the short front legs, while the head is bent down so that the foveate face is closely applied to the rounded back of his consort, thus doubtless affording additional assistance in maintaining his position; a bubble of air is trapped in the space between the head and the prothorax.

POROCORIXA HIRTIFRONS Hale.

Included in a batch of Corixids recently collected by Mr. F. W. Shepherd at Broken Hill, New South Wales, is a good series of *Porocorixa hirtifrons,* previously known only from a few more or less damaged specimens; this locality is, therefore, to be added to the known distribution of the species.

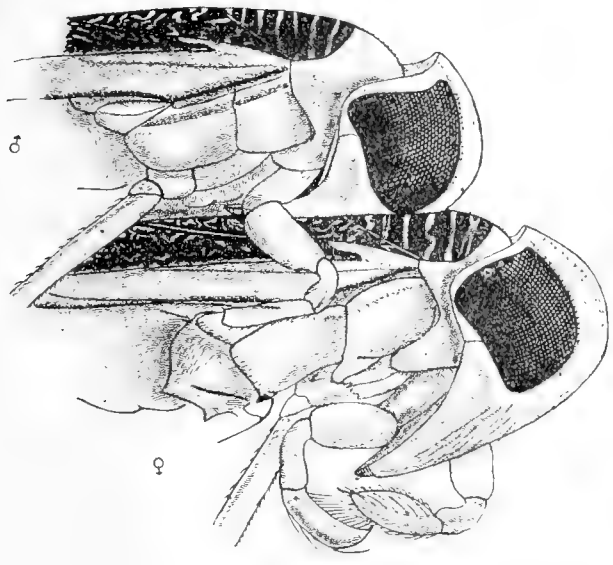


Fig. 372. *Arctocorisa truncatipala in copula.*

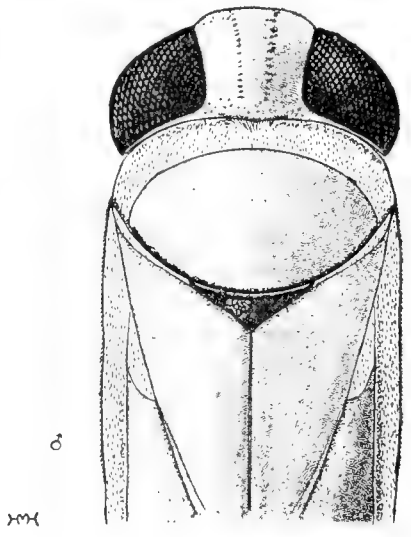


Fig. 373. *Porocorixa hirtifrons.*

The following additional notes are from these fresh examples.

Head pale ochraceous. The sub-elliptical, slightly raised area of the pronotum pale olivaceous-brown, not extending to the lateral edges; the anterior portion, including a broad lateral margin on each side, pale ochraceous; posterior edge very narrowly margined with brownish-black. Posterior angle of scutellum exposed, dull, black. Pegs of male palae twenty-three to twenty-seven. Underside grey, fading to ochraceous after drying.

(5) Bull. Univ. Kansas, xxi, 1919, p. 229.

From an examination of these undamaged examples it is evident that the head cannot entirely overlap the anterior pale portion of the pronotum; the actual condition is shown in fig. 373.

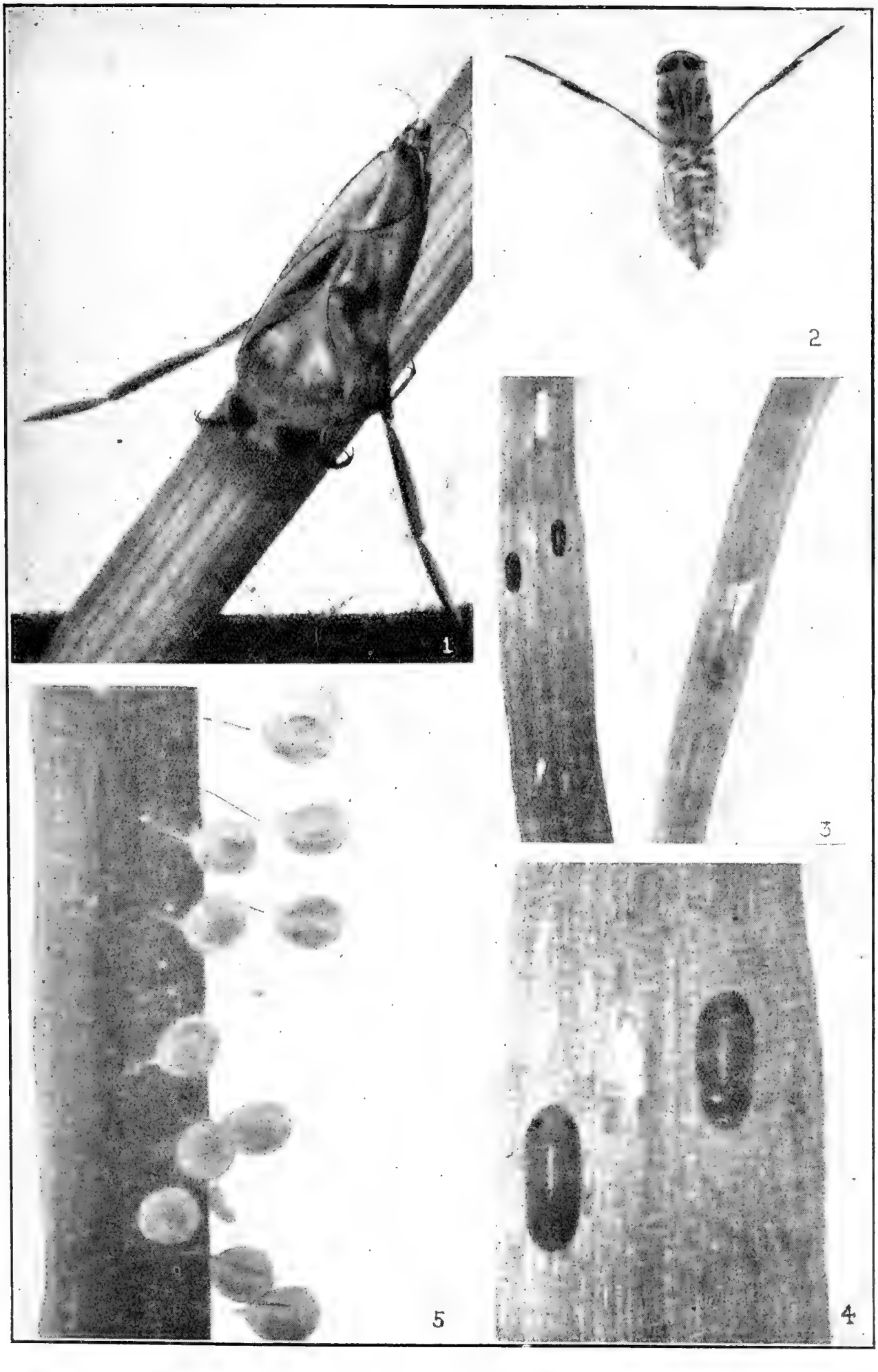
EXPLANATION OF PLATES.

Plate x.

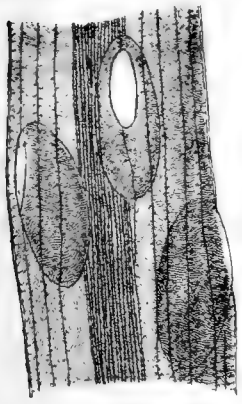
Fig. 1. *Enithares bergrothi* clinging to plant stem.
Fig. 2. *Anisops hyperion*, with guard hairs spread at surface.
Fig. 3. Eggs of *Anisops hyperion* partially inserted in leaf of *Vallisneria spiralis*; note the slits denoting abortive attempts to insert the ova in the thin tissue.
Fig. 4. Two of the eggs further enlarged; note the eyes of the developing embryo.
Fig. 5. Eggs of a Corixid (*Porocorixa eurynome*?), for comparison.

Plate xi.

Fig. 1 to 10. *Anisops hyperion.*
Fig. 1. Eggs *in situ* in *Potamogeton* stem; note the exposed portion.
Fig. 2. Egg, showing developing eye-pigment, etc.
Fig. 3 to 7. Dorsal and (a) ventral views of the five nymphal instars; the actual size from first instar nymph to imago is shown at (b).
Fig. 8. Ventral view of adult female.
Fig. 9. Intermediate leg of fifth instar nymph, showing the developing imaginal leg as seen through integument; note the two-jointed tarsus within the monomerous tarsus.
Fig. 10. The left member of the pair of gouging gonapophyses of the ovipositor; fig. 10a shows the tip of the organ further enlarged.
Fig. 11. Left gouging gonapophysis of *Anisops doris.*
Fig. 12. „ „ „ „ „ *gratus.*
Fig. 13. „ „ „ „ „ *stali.*
Fig. 14. „ „ „ „ „ *calcaratus.*
Fig. 15. „ „ „ „ „ *fieberi.*



AUSTRALIAN AQUATIC BUGS.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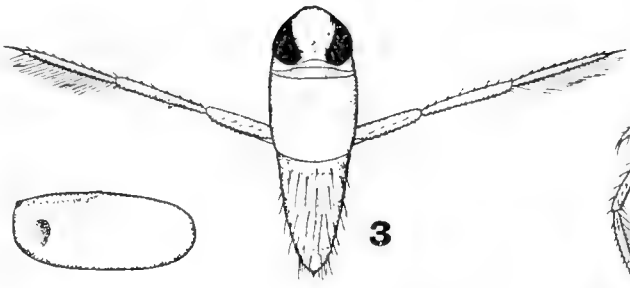
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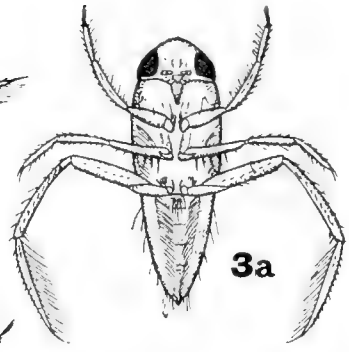
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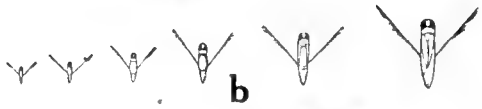
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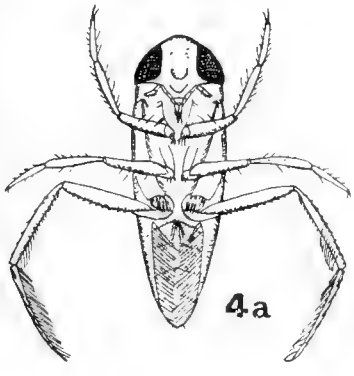
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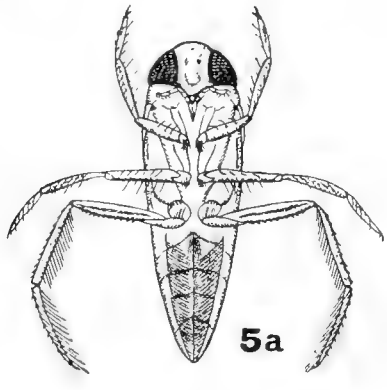
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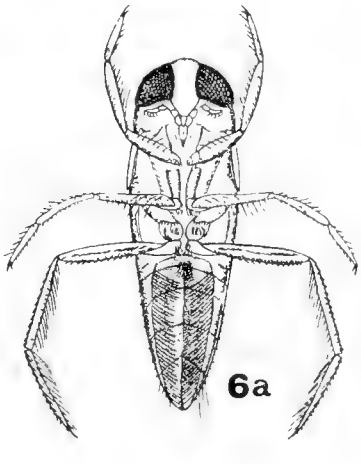
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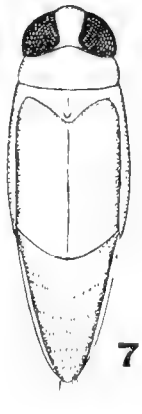
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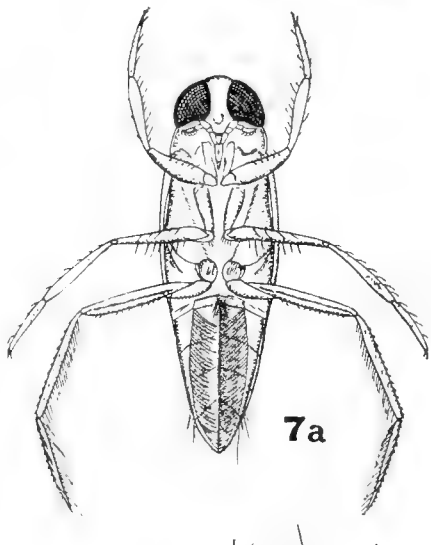
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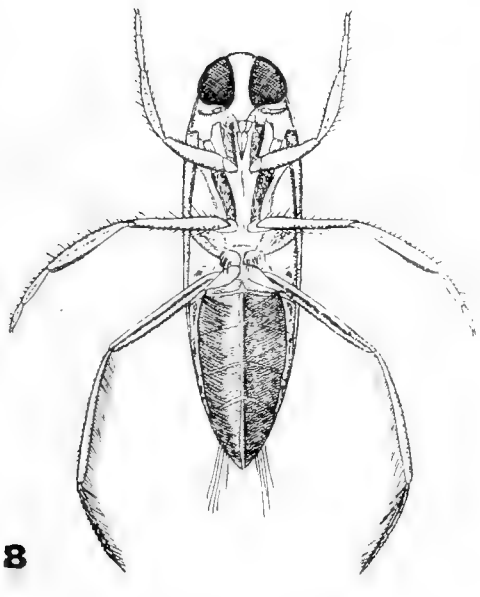
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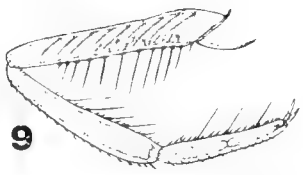
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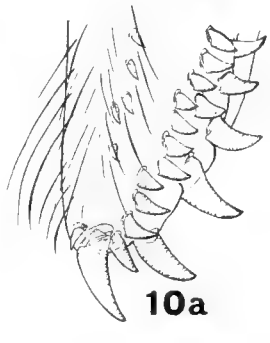
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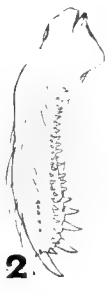
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AUSTRALIAN AQUATIC BUGS.

REVIEW OF AUSTRALIAN MANTIDAE.

By NORMAN B. TINDALE, S.A. Museum.

Plates xii–xxii and Text fig. 374–377.

The Mantidae herein dealt with comprise specimens taken by me during an extended visit to Groote Eylandt and Roper River, in the Gulf of Carpentaria, together with those in the South Australian Museum.

The descriptions of many of the species previously known were based on either male or female specimens, the other sex being unknown. In a number of instances this deficiency is made good.

Four genera and sixteen species are added, bringing the number of known Australian species to seventy-six.

Some sub-family and group names recently proposed are not adopted, and the practice of some workers of naming species from immature stages is not followed. The types of the species described by Tepper are in the South Australian Museum.

Sub-Family Perlamantinae.

PARAOXYPILUS Saussure, 1870 (tasmaniensis).

PARAOXYPILUS TASMANIENSIS Saussure.

Plate xiii, fig. 9–10, 14.

Paraoxypilus tasmaniensis Sauss., Mitt. Schweiz. Ent. Ges., iii, 1870, p. 227; Mem. Soc. Genève, xxi, 1871, p. 155, pl. i, fig. 49–50.

Hab. Tasmania (Type), New South Wales, Victoria, South Australia, Kangaroo Island, and Western Australia.

One of the males figured is from Tasmania, the other from Lillimur, Victoria (mainland specimens have the wings shorter). The female is from Adelaide; it was captured in January, and kept under observation. It deposited an ootheca, the eggs being laid on end alternately in two rows, forming a parallel-sided structure 9 mm. long, 3 mm. high, and 1·5 mm. wide, the whole operation taking less than three hours. The insect died two days later; the colour of the front femora and coxae, in life a brilliant orange-red, faded shortly after death. Sixteen larvae were discovered dead, having emerged in from 30 to 36 days. They measured 3 mm. in length, and were miniatures of the female.

PARAOXYPILUS LATICOLLIS sp. nov.

Plate xiii, fig. 11–13.

♂ Pale yellowish with black markings. Head with fore-margin of clypeus straight, hind-margin arched; facial shield narrow, near antennae excavated; frons with three prominences over ocelli; vertex nearly plain, arched in middle, coarsely punctured, without tubercles or spines; hind marginal projection behind eyes rounded; antennae black, similar to *P. tasmaniensis*. Pronotum shorter and broader than in *P. tasmaniensis*, with supra-coxal spine weaker; markings somewhat similar, but all spines and projections rounded off. Abdomen blackish. Wings hyaline, with dirty whitish and gray transverse marks and blotches, darkest on fore-margins and apex. Anterior coxae dilated, pale yellow, with base black, apex externally black, fore-margin with a spine near base and a marginal series of fine spines; femora pale yellow, apical half internally brownish with light spots; externally brown with darker punctures towards apex; tibiae and tarsi annulated black. Intermediate and posterior legs straw-coloured, annulated brownish-black. Length, 13·5 mm.

♀ Dark brown. Head large, broadly triangular, vertex strongly arched, wide, without spines; clypeus with fore-margin serrated, ocelli very small, prominences of frons weak. Antennae very fine, short. Pronotum almost as wide as long, similar to male, margin with a series of fine spines. Abdomen more pear-shaped than in female of *P. tasmaniensis*, sides only weakly serrated, margins of segments not markedly raised along median line, terminal one triangular. Anterior legs very strong, coloured and marked as in male. Length, 15 mm.

Hab. South Australia: Macdonnell Ranges (Captain S. A. White), Lake Callabonna (A. Zietz), Leigh Creek, Umberatana; Western Australia: Cunderdin. Types, I. 14050.

Allied to *P. tasmaniensis*. In the male the head is unarmed, pronotum wider, less armed, and wings much shorter. The female is much broader, head larger, unarmed, pronotum broader and abdomen narrower, less suddenly constricted before apex, and the margins quite different.

PARAOXYPILUS KIMBERLEYENSIS Sjöstedt.

Paraoxypilus kimberleyensis Sjöst., Ark. f. Zool., xi, 1918, p. 5, pl. iii, fig. 5–7; pl. v, fig. 1.

Hab. North-West Australia: Kimberley district (Type female), Fortescue River (W. D. Dodd).

♂ Brownish-black. Head as in female, eyes and ocelli more prominent, ocular spines somewhat less rounded. Pronotum triangular, similar to female, but somewhat rounded at posterior margin. Wings much longer than body, dark brown, hyaline. Anterior legs orange and black, marked as in female; posterior legs light-brownish. Length, 14 mm. Type, I. 14053.

PARAOXYPILUS FLAVIFEMUR Sjöstedt.

Paraoxypilus flavifemur Sjöst., Ark. f. Zool., xi, 1918, p. 3, pl. i, fig. 1a–1d; pl. iv, fig. 3.

Hab. Queensland, Northern Territory.

PARAOXYPILUS ARMATUS Giglio-Tos.

Plate xii, fig. 7–8.

Paraoxypilus armatus Gigl.-Tos, Gen. Ins., fasc. 144, 1913, p. 5.

♂ Brownish. Head small, wider than in *P. tasmaniensis*; ocular spines very large and strong. Pronotum well spined, less so than in female, median ridge weakly developed as five isolated spines. Wings long, whitish, hyaline, with veins faintly brown. Anterior coxae strongly developed, with a marginal series of about eight strong spines, with smaller spines between; femora weaker than in female, outer face brownish, inner face light brown. The posterior femora are blackish and tibiae and tarsi light brown. Length, 15 mm. Type male, I. 14054.

Hab. Queensland: Thursday Island (Type female), Kuranda; Northern Territory: Groote Eylandt, Melville Island, Daly River.

This species came to lights in my camp on Groote Eylandt on a sultry night in January, in company with hundreds of other insects. The type male figured is from Groote Eylandt, the female from Daly River.

PARAOXYPILUS VERREAUXII Saussure.

Plate xii, fig. 5–6.

Paraoxypilus verreauxii Sauss., Mém. Soc. Genève, xxi, 1871, p. 157; l.c. xxiii, 1872, p. 77; Giglio-Tos, Gen. Ins., fasc. 144, 1913, p. 5, pl. i, fig. 2.

Hab. Tasmania (Type), Queensland, Magnetic Island, South Australia.

PARAOXYPILUS INSULARIS sp. nov.

♀ Black with pale brownish markings. Head broad, triangular, vertex arched; fore-margin of clypeus nearly straight, sides diverging, hind-margin

strongly arched; ocelli small, connected by a wide transverse V-shaped ridge as in *P. verreauxii*; above ocelli a small ridge causing a rounded depression on frons; vertex without spines, except posterior marginal spine, which is strongly developed. Pronotum the shape of *P. verreauxii,* tubercles, depressions and elevations absent or ill-defined, scarcely any trace of a median ridge except at posterior extremity, where there is a single large arched elevation, supra-coxal spine strong, margins of pronotum possessing only very feeble spines. Abdomen long, narrow, oval, margins serrated towards posterior extremity, terminal segment triangular, borders not rugose. Anterior coxae weaker than in *P. verreauxii,* not dilated, light flesh-coloured, with several black spots at base, no marginal spines; femora marked externally with dense black spots and strigae, internally dull black with several flesh-coloured blotches on margin; tibiae and tarsi black. Intermediate and posterior legs annulated pale brown. Length, 16 mm.

Hab. Northern Territory: Groote Eylandt (N. B. Tindale). Type, I. 14052, unique.

Close to *P. verreauxii,* but distinguished by its less spiny head, arched vertex, and plainer pronotum, with very different median ridge. The abdomen is more slender and not wrinkled. The front coxae are also very different, being quite unarmed. It was taken in the sweep net when beating shrubs on the borders of a creek.

MYRMECOMANTIS Giglio-Tos, 1913 (atra).

Hab. Australia.

MYRMECOMANTIS ATRA Giglio-Tos.

Myrmecomantis atra Gigl.-Tos, Gen. Ins., fasc. 144, 1913, p. 6.

Hab. New South Wales.

METOXYPILUS Giglio-Tos, 1913 (spinosus).

Hab. New Guinea, Australia.

METOXYPILUS LOBIFRONS Stal.

Paraoxypilus lobifrons Stal., Bih. Svenska Akad., iv, 1877, p. 8; Westwood, Rev. Mant., 1889, p. 4; Wood-Mason, Cat. Mant., 1889, p. 2.

Hab. Queensland.

GYROMANTIS Giglio-Tos, 1913 (kraussii).

Hab. Australia.

GYROMANTIS KRAUSSII Saussure.

Haania kraussii Sauss., Mém. Soc. Genève, xxi, 1871, p. 153; *Paraoxypilus kraussii* Stal., Bih. Svenska Akad., iv, 1877, p. 8.

Hab. Western Australia, South Australia, and Central Australia, also from the junction of the Fitzroy and Margaret Rivers, North-west Australia.

GYROMANTIS OCCIDENTALIS Sjöstedt.

Gyromantis occidentalis Sjöst., Ark. f. Zool., xi, 1918, p. 8, pl. i, fig. 2a–2d, 3a–3c.

Hab. North-west Australia (Type), Northern Territory, as far south as Tennant Creek.

PHTHERSIGENA Stal., 1871 (conspersa).

Hab. Australia.

PHTHERSIGENA CONSPERSA Stal.

Phthersigena conspersa Stal, Oefv. Vet.-Akad. Förh., xxviii, 1871, p. 401; *Haania conspersa* Sauss., Mém. Soc. Genève, xxiii, 1872, p. 76; *Paraoxypilus conspersus* Stal, Bih. Svenska Vet.-Akad, iv, 1877, p. 9.

Hab. Queensland.

PHTHERSIGENA MINOR Sjöstedt.

Phthersigena minor Sjöst., Ark. f. Zool., xi, 1918, p. 10, pl. ii, fig. 1a–1e.

Hab. North-west Australia.

PHTHERSIGENA CENTRALIS Giglio-Tos.

Phthersigena centralis Gigl.-Tos, Bull. Soc. Ent. Ital., 1914, p. 32.

Hab. Central Australia.

This species is about the size of *P. minor*, but the pronotum is relatively larger.

GLABROMANTIS Sjöstedt, 1918 (nebulosa).

Sjöst., Ark. f. Zool., xi, 1918, p. 12.

Hab. Australia.

The females of this genus have the wings short, reaching only to about three-quarters length of abdomen. The head is broad and the eyes less prominent than in male. The antennae are very fine and filamentous, reaching to

the end of pronotum. Pronotum broad, slightly compressed towards posterior extremity. Anterior coxae dilated near base, femora broad, tibial spur shorter, not projecting from outer margin of femur when closed, as in male. Legs annulated dark-brown.

The female of *G. unicornis* has very powerful front legs, which are jet black on their inner face.

GLABROMANTIS NEBULOSA Sjöstedt.

Glabromantis nebulosa Sjöst., Ark. f. Zool., xi, 1918, p. 13, pl. ii, fig. 2a–2e.

Hab. North-west Australia.

GLABROMANTIS UNICORNIS sp. nov.

Plate xii, fig. 1–2.

♂ Gray, with blackish punctures, spots, and marks. Head somewhat broad, black; eyes oval, projecting outward and forward, sides somewhat compressed; clypeus four-sided, divided across middle by a longitudinal keel; facial shield twice as wide as high, arched strongly in middle, the summit projecting outward in a conspicuous spine-like process; frons rounded over ocelli, ocelli not prominent; vertex plain, a transverse line at middle, and also a median line; hind-margin with a strong, rounded, ocular lobe. Antennae long, strong, basal joint the largest, second and third smaller, fourth very small, the following joints gradually longer. Pronotum $1\frac{1}{3}$ times long as wide, widest at middle, before middle excavated, front-margin arched; at three-fourths constricted; hind-margin rounded off; a median line conspicuous, a lateral groove before middle and a shallower groove at three-fourths; between antemedian groove and fore-margin a central depression; markings grayish-black. Anterior coxae broadest at base, pale yellowish, with dark punctures on outer side; femora weak, pale yellow, outwardly spotted black, with three discoidal spines, the third small and inconspicuous; inner margin with a large spine, then a fine comb of nine spines, followed by four separated spines, of which the third is largest; outer margin with five spines, the fifth close to apex; tibial spine long, projecting above border of femur when leg is closed, tibia armed on inner margin near apex, with a fine comb of nine spines; outer margin with only traces of a row of spines; first tarsal joint longer than rest together. Legs yellowish with darker markings. Length, 19 mm.

♀ Light brown with black markings. Broader than male. Head and pronotum as in male. Antennae short and filamentous. Wings short, reaching to two-thirds length of abdomen, opaque, strongly marked dirty yellow and black.

Anterior coxae dark yellowish, with black spots; femora strong, inner face shining jet black, spines as in male. Legs as in male. Length, 18·5 mm.

Hab. South Australia: Murray River (H. S. Cope), Pungonda (A. Dubbe), Tintinara, Murat Bay, Illamurta (Horn Expedition), Lake Frome (J. N. McGilp). Types, I. 14046.

This species is distinguished from *G. nebulosa* Sjöst. by the peculiar head and the projection on facial shield. The male from Lake Frome is small, measuring only 12 mm. in length. We have seven males and four females.

GLABROMANTIS UNICORNIS PALLIDIFEMUR subsp. nov.

♂ Light brown with gray markings. Head very wide, with eyes prominent. Facial shield twice as wide as high, arched above, with apical spine absent or weakly developed, fore-margin straight, at each end of fore-margin a yellowish spot; frons with three prominences over ocelli, the median one well forward, projecting, well rounded; ocular spine pointed, not a rounded lobe. Antennae long, nearly reaching end of abdomen. Pronotum 1¼ times long as wide, oval, sides arched, less conspicuously constricted towards posterior extremity than in *G. unicornis*, black with brownish markings; sometimes a faint light-coloured spot on each side of middle of pronotum below transverse groove. Wings long; elytra hyaline, suffused dirty whitish and black marks; hind-wings hyaline, fore-margin darker. Anterior legs yellowish-brown, externally marked with darker spots; intermediate and posterior legs annulated light-brown. Length, 19 mm.

♀ Larger than male. Pale yellowish, with brownish-black spots and markings. Head large, apex of facial shield forming a small projection, ocelli very small. Pronotum longer than in *G. unicornis*, arched at middle, constricted strongly at three-fourths; markings as in male. Elytra opaque, dirty gray, with black markings; hind-wings hyaline. Anterior coxae pale yellow; femora pale yellow, mottled brownish; legs yellowish, annulated brown-black. Length, 22 mm.

Hab. South Australia: Kingoonya (R. Harvey), Mount Painter (H. G. Stokes), North East Corner (F. Parsons). Types, I. 14048.

This has been placed as a race of *G. unicornis*; it has a different shaped head, longer pronotum, and in female pale front femora and tibiae. We have three males and two females.

GLABROMANTIS MELANIA sp. nov.

Plate xii, fig. 3.

♂ Dark reddish-brown with dull black markings. Head smaller than in *G. unicornis*; facial shield arched on posterior margin and with a V-shaped

median notch; frons elevated, truncated, prominences well rounded, vertex arched in middle, posterior ocular lobes rounded, small. Antennae fine, about half-length of body. Pronotum black, with reddish-brown prominences, about as long as wide, broadest at middle, constricted before posterior margin, fore-margin gently rounded, surface of pronotum with a median line, a transverse depression before middle, a raised circular area in front of this, with a depressed centre, a transverse depression, and two oblique raised lines on posterior half, forming a raised, equilateral triangle-shaped area. Wings longer than body, narrow, hyaline, with closely set brownish-black markings. Anterior coxae black at base, then pale reddish, at apex black; femora strong, outwardly black, inner face light reddish; tibiae black, tarsi brown; legs reddish-brown. Length, 14·5 mm.

Hab. Northern Territory: Pine Creek. Type, I. 14044, unique.

Distinct, by its dark colour, notched facial shield, short body, long slender wings, and bright coloured fore-coxae and femora. It is very different from the figure of *G. nebulosa*, especially in the arched head, less prominent eyes, different contour of pronotum, and the red and black anterior legs.

AMORPHOSCELIS Stal, 1871 (annulicornis).

Hab. Africa, extending to India and Borneo.

AMORPHOSCELIS PELLUCIDA Westwood.

Amorphoscelis pellucida West., Rev. Mant., 1889, p. 28.

Hab. Westwood says of this species: "Habitat Adelaida (Fortnum) in Mus. Hope; alterum e Ceylonia (Thwaites) omnino simillimum accepi." It is probable, however, that the species has been recorded from Australia in error.

CLIOMANTIS Giglio-Tos, 1913 (cornuta).

Hab. Australia.

CLIOMANTIS CORNUTA Giglio-Tos.

Plate xii, fig. 4.

Cliomantis cornuta Gigl.-Tos, Gen. Ins., fasc. 144, 1913, p. 12.

Hab. Queensland, Northern Territory.

There are ten males in the Museum collection. The specimen figured is from Darwin; one was taken at lights at Roper River. The female is probably apterous.

CLIOMANTIS DISPAR sp. nov.

Plate xiii, fig. 15, and text figure 374.

♂ Dull brown. Head triangular, wide, eyes rounded, clypeus transverse; facial shield strongly transverse; ocular spines less prominent than in *C. cornuta*, and blunt pointed; frons bifurcate. Antennae pale brown, basal joints darker. Pronotum about twice width of head in length, widest anteriorly, sides constricted to middle, where it is slightly dilated, and again constricted before posterior extremity; a slight raised median keel is divided by a transverse shallow groove near middle of pronotum. Abdomen short. Forewings longer than abdomen, hyaline, with numerous fuscous markings more dense along fore-margin; a dark median streak between the veins in basal third of wing; hind-wings very long, hyaline, with fuscous markings on fore-margin. Anterior

Fig. 374. *Cliomantis dispar* sp. nov. Left anterior leg of male.

femora somewhat strongly dilated, armed with three discoidal spines, an internal marginal row of thirteen spines, the first strong, the next six forming a fine comb, then six separated spines, of which the apical one is strongest; an exterior marginal series of five spines; there is also in femoral groove a series of about thirteen very fine spines; tibiae armed with an internal marginal row of eight spines, the first four separate, the remainder together at base of tibial spine, also an external marginal series of thirteen very minute spines. Legs long and slender, dark brown. Length, 15 mm.

♀ Grayish brown. Head larger than in male, eyes very prominent, clypeus less transverse, facial shield broad, slightly wider than high. The margin of pronotum less sinuate. Wings absent. Abdomen long, slightly dilated, mottled gray brown, tending to brown at posterior margin of each segment. Legs as in male. Length, 14 mm.

Hab. South Australia: Parachilna (Natural History Expedition), Tarcoola, Barton (A. M. Lea), Farina, Ooldea, Todmorton (Captain S. A. White); Central Australia: Carraweena, Trinity (Museum Exped., 1916), Macdonnell and Everard Ranges (Captain S. A. White). Type male, I. 14043; type female, I. 14045.

This species, the males of which we have a long series, appears to be common in the dry parts of the interior of South Australia. The type male is from Parachilna, in the Flinders Range. The female is described from a single specimen, apterous, but apparently mature, taken by Mr. A. M. Lea at Barton, while beating shrubs. The males frequently come to lights.

COMPSOTHESPIS Saussure, 1872 (anomala).

Hab. Africa, with one species recorded from Australia.

COMPSOTHESPIS AUSTRALIENSIS Wood-Mason.

Compsothespis australiensis Wood-Mason, Cat. Mant., 1889, p. 7, fig. 4; Westw., Rev. Mant., 1889, p. 32, pl. xii, fig. 11.

Hab. Queensland and "North Australia."

SUB-FAMILY EREMIAPHILINAE.

This subfamily is represented in Australia by the genus *Orthodera.* The species are so extremely variable that it is difficult to find satisfactory characters on which to separate them.

ORTHODERA Burmeister, 1838 (ministralis).

Hab. This genus is confined to Australia, New Guinea, and New Zealand.

ORTHODERA MINISTRALIS Fab.

Plate xiv, fig. 18–20, and text figure 375.

Mantis ministralis Fab., Syst. Ent., 1775, p. 277; *Paraoxypilus ? ministralis* Sauss., Mém. Soc. Genève, xxi, 1871, p. 158; *Orthodera ministralis* Wood-Mason, Cat. Mant., 1889, p. 20; *Orthodera prasina* Burmeister, Handb. Ent., ii, 1838, p. 529; Sauss., Mém. Soc. Genève, xxi, 1871, p. 15; Tepper, Trans. Roy. Soc. S.A., xxix, 1905, p. 238; *Mantis rubrocoxata* Serville, Hist. Nat. Orth., 1839, p. 203; *Mantis hobsonii* Le Guillou, Rev. Zool., 1841, p. 293; *Bolidena hobsonii* Blanchard, Voy. au Pole Sud, iv, 1853, pl. i, fig. 7; *Mantis gunnii* Le Guill., l.c., p. 293; *Orthodera laticollis* Brancsik, Jahresh. Nat. Ver. Trencsen. Kom., 1896, p. 246, pl. vii, fig. 5a; *Orthodera australiana*

Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 107; *Orthodera gracilis* Giglio-Tos, l.c., p. 107.

Hab. Queensland, New South Wales, Victoria, Tasmania, South Australia, Kangaroo Island, Central Australia, Western Australia, North-west Australia, Northern Territory, Groote Eylandt.

An examination of ninety specimens shows a wide range of variation, and this variation is responsible for the extensive synonymy. The illustrations are a selected series of eight male and twenty female pronoti arranged to show the great variation in the shape of pronotum and head.

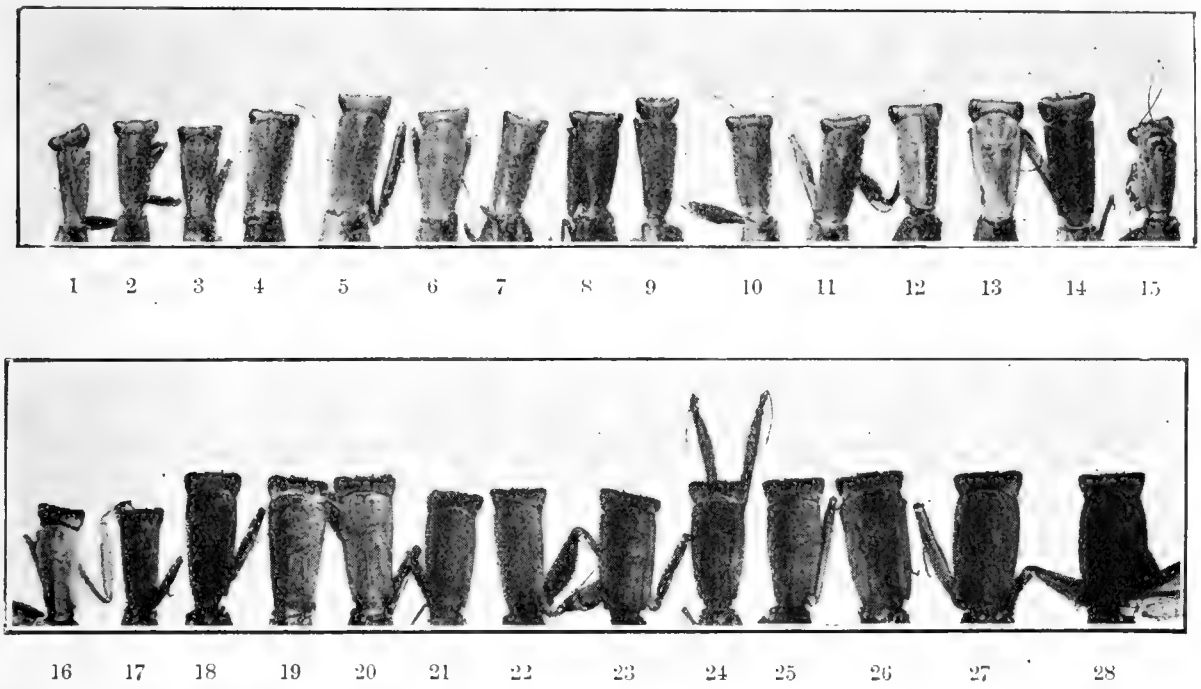

Fig. 375. 1-28. *Orthodera ministralis* Fab. (1, male, Derby, N.W.A.; 2, male, Fortescue River, N.W.A.; 3, female, Flinders Range, S.A.; 4, female, Darke's Peak, S.A.; 5, female, Port Augusta, S.A.; 6, female, S.A.; 7, male, Ellery's Creek, C.A.; 8, female, Karoonda, S.A.; 9, male, Cairns, N.Q.; 10, male, Tasmania; 11, female, Kewell, V.; 12, male. Dalby, Q.; 13, male, Darwin, N.T.; 14, female, Darwin, N.T.; 15, male, Groote Eylandt); 16-28, females (16, Tennant's Creek, N.T.; 17, Victoria Desert, C.A.; 18-19, Groote Eylandt; 20, Cairns, N.Q.; 21-22, Dalby, Q.; 23, Dorrigo, N.S.W.; 24, Tasmania; 25-26, Adelaide, S.A.; 27, Ooldea, S.A.; 28, Queensland).

Nos. 1 and 2 are small, and agree with small females (e.g., Nos. 3, 16–17) in having no femoral spot, but Nos. 4 and 8 are intermediate, possessing a small spot. No. 7, which is otherwise inseparable from No. 3, has a large black femoral spot extending over the whole middle area of the femora. No. 9 is more distinct, but females from the same locality are inseparable from the others. No. 10 is *O. hobsonii*, and No. 11 is very close, except that the facial shield is less transverse. No. 9 has the narrowest and longest pronotum, and approaches the figure of *O. straminea* in the shape of the eyes and head. The females show great variation in the proportions of pronotum, generally speaking, southern examples being

broader, but No. 28, from Queensland, is by far the broadest. No. 24 is *O. hobsonii*, female, but differs but little from No. 25, which is a mainland specimen.

This species is wide-ranging, but has not developed clearly defined races. The name, *O. ministralis hobsonii*, may be retained for Tasmanian examples, which appear to have the facial shield transverse.

ORTHODERA MARGINATA Saussure.

Plate xiv, fig. 16–17.

Orthodera marginata Sauss., Mém. Soc. Genève, xxxiii, 1872, p. 8, pl. viii, fig. 1; Wood-Mason, A.M.N.H. (4), xx, 1877, p. 76; Tepper, Trans. Roy. Soc. S.A., xxix, 1905, p. 238.

Hab. New South Wales, South Australia, Central Australia, and Western Australia.

This species is distinguished by its slender pronotum and the orange fore-margin of elytra. The male figured is from Adelaide, the female from Mount Painter. We have nearly thirty specimens, which do not show any variation towards the other members of the genus.

ORTHODERA BURMEISTERI Wood-Mason.

Plate xiv, fig. 21–22.

Orthodera burmeisteri Wood-Mason, Cat. Mant., 1889, p. 21; *Orthodera longicollis* Brancs., Jahresb. Nat. Ver. Trencs., 1897, p. 61, pl. i, fig. 6.

♀ Allied to *O. ministralis*, but differs in being longer and more slender. Head very similar, wider, vertex arched, eyes bluntly pointed; facial shield with corners rounded, ocelli less prominent. Pronotum long, margins nearly smooth, pale silvery green, a median area reddish (in dried specimen). Wings long, pale silvery green, hyaline, fore-margin of front wings reddish. Legs orange, anterior femora with a green area on inner face. Length, 38 mm.

Hab. New Guinea (Port Moresby, type); Queensland: Dalby (Mrs. F. H. Hobler).

Our single female agrees very well with the description of this species, which was first recorded from New Guinea. The measurements given in the original description agree, except that in the present specimen posterior femora and tibiae are each 1 mm. shorter.

ORTHODERINA Sjöstedt, 1918 (straminea).

ORTHODERINA STRAMINEA Sjöstedt.

Orthoderina straminea Sjöst., Ark. f. Zool., xi, 1918, p. 16, pl. iv, fig. 4a–c.

Hab. North-west Australia, Northern Territory.

SUB-FAMILY IRIDOPTERIGINAE.

BOLBE Stal, 1877 (pygmea).

Hab. Australia.

BOLBE PYGMEA Saussure.

Ameles pygmea Sauss., Mém. Soc. Genève, xxi, 1871, p. 299; *Bolbe pygmea* Kirby, Cat. Orth. Mant., 1904, p. 226; Sjöstedt, Ark. f. Zool., xi, 1918, p. 17.

Hab. Queensland, Western Australia, and North-west Australia (Sjöstedt), Northern Territory.

We have three males of this small mantis, from Darwin and Daly River.

BOLBE MAIA sp. nov.

♂ Small, dark brown with lighter markings. Head large, black; frons, from above, prominent, with ocelli forming three projections, vertex almost straight, broad, and smooth. Antennae more than half length of body, black, with numerous setae. Pronotum 1½ times long as broad, widest before middle, and constricted at three-quarters. Anterior and posterior margins rounded, a transverse furrow, indistinct before middle, surface of pronotum smooth, in some specimens with a slight metallic lustre. Wings hyaline, with transverse black markings, giving wings dark-gray appearance. Abdomen black. Anterior legs wholly bright orange-brown. Intermediate and posterior legs dull brown. Length, 8 mm., of elytra, 8·5 mm.

Hab. Groote Eylandt, Northern Territory (N. B. Tindale). Type, I. 14056.

This species, which in life is dark brown, flew freely to lights in my camp at Yetiba, Groote Eylandt, on sultry nights, all through the "wet" season (December to March). It was very active, flying and running around the table and the rim of the lamp, often capturing small flies and other insects which had been attracted to the light. Owing to its quickness it was very difficult to capture. It is the smallest mantis so far known. "Maia" is derived from a Groote Eylandt (Ingura) native word meaning "active." We have a single male from Darwin.

BOLBE NIGRA Giglio-Tos.

Bolbe nigra Gigl.-Tos, Bull. Soc. Ent. Ital., 1914, p. 35.

Hab. South Australia, Central Australia.

The female is wingless. We have a long series of the males of this species. The inner face of front coxae and femora is jet black in both sexes. In 1912, Werner(1) identified two larvae, probably of this species, as *Bolbe fuliginosa.*

BOLBE PALLIDA sp. nov.

♂ Pale brownish. Close to *B. nigra*, but smaller. Head moderate, with face almost as high as broad; eyes rounded, large, not projecting, the inner margins (viewed from in front) straight; ocelli less prominent, the central ocellus smaller and more rounded, vertex nearly straight, well rounded, forming a transverse ridge behind ocelli. Pronotum much wider than in the other species of genus; a transverse median and postmedian suture dividing pronotum into a number of low rounded ridges. Wings much longer in proportion, pale brownish, hyaline, with light brown veins and veinlets. Anterior legs wholly pale brown, with a few scattered darker brown marks on exterior face of femora. Median and posterior legs pale brown, faintly annulated darker brown. Length of body, 11 mm., of elytra, 13 mm.

Hab. Central Australia: Mount Parry (Prof. R. Tate, October, 1889), Finke Gorge (Horn Expedition, 1894), Farina (Museum Expedition, 1916). Type, I. 14055.

We have three males of this small mantis, which is easily distinguished by the peculiar head and eyes, long wings, and pale anterior legs.

NEOMANTIS Giglio-Tos, 1914 (australis).

Hab. Australia.

NEOMANTIS AUSTRALIS Saussure and Zehnter.

Tropidomantis australis Sauss. & Zehn., Grandid. Hist. Madag. Orth., i, 1895, p. 169; *Neomantis australis* Giglio-Tos, Bull. Soc. Ent. Ital., 1914, p. 48.

Hab. Murray Island (Torres Straits).

STENOMANTIS Saussure, 1871 (novae-guineae).

Stenomantis Sauss., Mém. Soc. Genève, xxi, 1871, p. 311.

Ciulfina Giglio-Tos, Bull. Soc. Ent. Ital., 1914, p. 64.

Nanomantis biseriata, the type of *Ciulfina*, is a subspecies of *N. novae-guineae*, and thus *Ciulfina* is a direct synonym of *Stenomantis.*

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(1) Werner, Fauna Sudwest Austral., 1912, p. 49.

STENOMANTIS NOVAE-GUINEAE Haan.

Hab. New Guinea.

STENOMANTIS NOVAE-GUINEAE BISERIATA Westwood.

Plate xv, fig. 27–28.

Nanomantis biseriata Westwood, Rev. Mant., 1889, p. 32; *Stenomantis novae-guineae brevis* Werner, Fauna Sudw. Aust., iv, 1912, p. 52.

Hab. North-west Australia (Type), Northern Territory, Melville Island, Groote Eylandt, Queensland.

The length of pronotum varies considerably in the series examined; there is only one race, however, represented from Australia. The specimens figured are from Cairns.

STENOMANTIS LITURGUSA Giglio-Tos.

Ciulfina liturgusa Gigl.-Tos, Bull. Soc. Ent. Ital., 1914, p. 64.

Hab. Queensland, South Australia.

NANOMANTIS Saussure, 1871 (australis).

Hab. Australia and the Malay Archipelago.

NANOMANTIS AUSTRALIS Saussure.

Nanomantis australis Sauss., Mém. Soc. Genève, xxi, 1871, pp. 117, 311, pl. vii, fig. 64.

Hab. Australia.

SUB-FAMILY SIBYLLINAE.

GONATISTELLA Giglio-Tos, 1914 (nigropicta).

Hab. Australia.

GONATISTELLA NIGROPICTA Westwood.

Theopompa nigropicta Westw., Rev. Mant., 1889, p. 29, pl. ii, fig. 6; *Gonatistella nigropicta* Giglio-Tos, Bull. Soc. Ent. Ital., 1914, p. 80.

Hab. Australia.

SUB-FAMILY MANTINAE.

ARCHIMANTIS Saussure, 1869 (latistyla).

Hab. Australia.

ARCHIMANTIS LATISTYLA Serville.

Plate xvi, fig. 32; xix, fig. 47.

Mantis latistylus Serv., Ins. Orth., 1839, p. 179; McCoy, Prod. Zool. Vict., xiii, 1886, pl. cxxx; *Archimantis latystilus* Sauss., Mém. Soc. Genève, xxi, 1871, p. 39.

Hab. South Australia and Western Australia.

ARCHIMANTIS SOBRINA Saussure.

Plate xvi, fig. 31.

♂ Smaller than female. Pale green in life. Head smaller, ocelli prominent, antennae long. Pronotum long and broad, shape of female. Wings long, hyaline, immaculate, a greenish tinge on fore-margins. The elytra beneath have at base an anterior marginal black patch, and the reticulation on rest of margin is black. Cerci flat, narrower than in female, the apical joint very long and blunt pointed. Length of body, 90 mm., of elytra, 110 mm.

Hab. Western Australia, South Australia, Western Queensland, Northern Territory.

The female figured is from Cunnamulla, and is 99 mm. in length. This is a large, stout species, and seems to be most common in the interior. Males are very similar to those of *A. brunneriana*, but the front femora are much narrower and the pronotum longer.

ARCHIMANTIS MINOR Giglio-Tos.

Plate xviii, fig. 39.

Archimantis minor Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 43.

Hab. Western Australia.

This is a rather small species, of which we have four females from Beverley The pronotum is very similar to *A. sobrina*, but the wings are short, brown, and with a black discoidal spot.

ARCHIMANTIS BRUNNERIANA Saussure.

Plate xviii, fig. 40.

Archimantis brunneriana Sauss., Mém. Soc. Genève, xxi, 1871, p. 277; l.c., 1873, pl. viii, fig. 4.

♀ Larger than male. Brown, with darker markings. Head larger, eyes more depressed, divergent, ocelli very small, widely separated, antennae short. Pronotum like male, but broader, and with anterior margins more serrated.

Wings longer than pronotum; elytra opaque, brown, with well developed antemedian and median black spots, reticulations black, fore-margin at base beneath black, and reticulations along margin black, rest of elytra rich brown; hind-wings hyaline, with fore-margin brown. Abdomen light brown, cerci long, flattened, broad, the last segment round. The anterior coxae with five rather small spines on fore-margin. Legs brown. Length of body, 95 mm., of pronotum, 34 mm., of expanded elytra, 76 mm. Murray River (H. S. Cope, Type female, I. 14066).

Hab. Queensland, Northern Territory, Central Australia, and South Australia.

The males have a broader pronotum than *A. latistyla*, and are generally green when alive. The females in our long series are all brown.

ARCHIMANTIS QUINQUELOBATA Tepper.

Plate xvii, fig. 35–37.

Fischeria quinquelobata Tepper, Trans. Roy. Soc. S.A., 1905, p. 238; *Rheomantis quinquelobata* Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 44.

♂ Smaller than female. Pronotum more slender, anterior margin with only very fine serration. Wings long, complete, the elytra with anterior half opaque, brown, with two black spots at one-third, the posterior portion hyaline; hind wings hyaline, brownish on anterior margin and apex. Anterior coxae armed with four (sometimes five) triangular teeth. Length of body, 77 mm., of elytra, 86 mm. Mount Painter (H. G. Stokes, Type male, I. 14067).

Hab. South Australia, Central Australia.

The specimen described as a male by Tepper is really a small female. The sexes are very different. The male figure is from Mount Painter, the female (a cotype) from the Fraser Range, where the native name is said to be "kamuan." Giglio-Tos(2) has proposed a genus *Rheomantis* for this species, which, however, appears to be a typical *Archimantis*.

ARCHIMANTIS ARMATA Wood-Mason.

Plate xvi, fig. 33.

Archimantis armata Wood-Mason, Ann. Nat. Hist. (4), xx, 1877, p. 76; Proc. Zool. Soc. Lond., 1878, p. 584, pl. xxxvi, fig. 2–2a.

♂ As large as female, brown. Head smaller, antennae very long and stout at base. Pronotum as long as in female, very slender, somewhat dilated near anterior extremity, posteriorly to dilatation very slender and constricted nearly to posterior margin, margins entirely plain, surface of pronotum smooth.

(2)Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 44.

Wings long, hyaline, elytra with a narrow fore-marginal opaque area, diminishing towards apex, and with two black spots, not very well defined. Anterior legs shorter and finer than in female. Length of body, 98 mm., of pronotum, 35 mm., of elytra, 56 mm. Cairns (A. M. Lea, Type male, I. 14068).

Hab. Queensland.

We have a pair of this species from Cairns. The female agrees with Wood-Mason's figure, except that the spines of pronotum are less densely set and somewhat more blunted in appearance. The apical joint of the cerci is broad and twice as long as wide.

ARCHIMANTIS MONSTROSA Wood-Mason.

Plate xvi, fig. 29–30; xvii, fig. 38.

Archimantis monstrosa Wood-Mason, Proc. Zool. Soc. Lond., 1878, p. 583, pl. xxxvi, fig. 1–1b; Westwood, Rev. Mant., 1889, p. 9, pl. iii, fig. 1; *Mantis fuscoelytris* McCoy, Prodr. Zool. Vic., xiii, 1886, p. 4; *Archimantis latizonata* Sjöst., Ark. f. Zool., xi, 1918, p. 21, pl. vi, fig. 1a–b.

♂ Smaller than female, brown. Antennae very long. Pronotum as in female, but slightly less dilated, margins strongly serrated. Wings long, hyaline, the fore-margin of elytra reticulated black, and with black spots as in the other sex. Legs concolorous. Length of body, 93 mm., of pronotum, 32 mm., elytra, 54 mm. Roper River (H. E. Warren). Type, male, I. 14069.

Hab. Northern Territory: Victoria River (type), Darwin, Stapleton, Roper River, Groote Eylandt, North-west Australia.

The first female from Groote Eylandt (fig. 29) has the pronotum shaped as in the figure of the type. The other specimen (from Roper River) has the pronotum very strongly dilated, and this seems to be the more usual form in the Northern Territory. Sjöstedt's figure of a "male" larva agrees with other larvae of this species in our big series.

ARCHIMANTIS STRAMINEA Sjöstedt.

Archimantis straminea Sjöst., Ark. f. Zool., xi, 1918, p. 17, pl. v, fig. 4a–b; pl. vi, fig. 2a–3.

Hab. North-West Australia.

NULLABORA gen. nov.

Head twice as wide as high, very narrow, concave in front, eyes tapering to a blunt point, vertex straight, eyes depressed, clypeus quadrilateral, fore-margin excavated, facial shield transverse, sides and upper margin sinuate, frons trans-

versely excavated, straight. Antennae fine, ocelli small (female). Pronotum six times longer than wide, fore-margin rounded, a slight constriction, then a slight dilatation before one-third, thence sides parallel to posterior angle, which is a trifle dilated, margins delicately serrate, surface of pronotum smooth. Wings transparent, as long as abdomen. Abdomen moderately slender, parallel-sided, cerci broad, flat, with eleven apparent joints, hairy, apical joint triangular. Anterior coxae long, flattened, thin, margins weakly spined; femora long, armed with four discoidal spines, the second small, third large, inner margin with fifteen spines, outer margin with four, tibia with 14–15 inner and 10–11 outer marginal graduated spines; first joint of the tarsi longer than four following together.

Type, *Nullabora flavoguttata*, from the Nullabor Plains.

In this genus the female is fully winged. The male is unknown.

NULLABORA FLAVOGUTTATA sp. nov.

Plate xviii, fig. 41, and text figure 376.

♀ Yellowish-green with purplish-brown markings (in dried specimen). Head with frons depressed, whitish. Pronotum smooth, greenish, with a submarginal border of purplish-brown, interrupted at the supracoxal dilatation. Prosternum with broad longitudinal band, black. Wings transparent, fore-margin of elytra green, with a dark submarginal line. Abdomen greenish, above with a dark central line of purplish-brown, beneath, at the base of segments 2 to 5, a large median orange spot surrounded by a triangular area of purplish-brown; cerci brownish-black, hairy. Legs greenish, inner face of anterior coxae pale purple. Length, 66 mm., pronotum, 23 mm., wings, 40 mm.

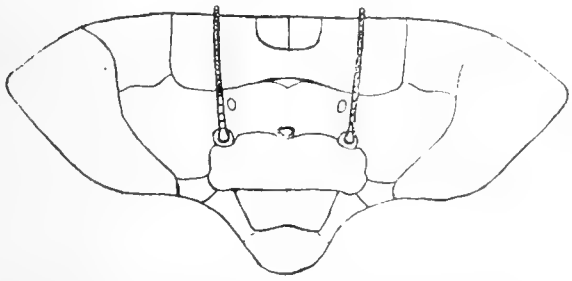

Fig. 376. *Nullabora flavoguttata* sp. nov. Head of female.

Hab. South Australia: Kingoonya (R. Harvey, Type, I. 14070); Northern Territory (Capt. S. A. White).

This peculiar mantis from the desert plains of the north-west of South Australia is probably a grass-frequenting species. It is not apparently close to any other species.

RHODOMANTIS Giglio-Tos, 1916 (pulchellus).

Rhodomantis Giglio-Tos, Bull. Soc. Ent. Ital., 1916, p. 45.

Truxomantis Sjöstedt, Ark. f. Zool., xi, 1918, p. 31.

RHODOMANTIS PULCHELLA Tepper.

Plate xv, fig. 26.

Pseudomantis pulchellus Tepper, Trans. Roy. Soc. S.A., 1904, p. 163; *Truxomantis kimberleyensis* Sjöst., Ark. f. Zool., xi, 1918, p. 33, pl. iii, fig. 4; pl. v, fig. 6.

Hab. South Australia, Western Australia, North-west Australia. Type, I. 13779.

The type, a female, of this species came from the far N.W. of South Australia (Wells Expedition, March, 1903). It is in rather damaged condition. We have a series of seven males and four females. They agree well with Sjöstedt's description and figures. The figure is of a male from Mount Painter.

RHODOMANTIS QUEENSLANDICA Sjöstedt.

Truxomantis queenslandica Sjöst., Ark. f. Zool., xi, 1918, p. 31, pl. iii, fig. 3; pl. v, fig. 5.

Hab. Queensland.

RHODOMANTIS GRACILIS sp. nov.

Plate xv, fig. 25.

♂ Pale brown. Head similar to *R. pulchella*, ocelli less prominent, antennae much finer. Pronotum very slender, much longer, supracoxal dilatation well forward, margins of pronotum finely serrated, the stem with a median and two lateral longitudinal ridges, armed with coarse spinules. Wings shorter, narrow, reaching two-thirds length of abdomen; elytra hyaline, brownish, with fine scattered blackish spots; hind-wings hyaline, a basal area brownish black, becoming paler outwardly, and with scattered transverse hyaline patches. Cerci longer, and more slender. Legs very long, fine, the anterior femora very slender at base. Length, 43 mm., pronotum, 13 mm., elytra, 19 mm.

Hab. Northern Territory: Groote Eylandt (N. B. Tindale), Connexion Island (April, 1922). Type, I. 14063.

Close to *R. pulchella*, from which it differs in its smaller size, longer pronotum, shorter wings, darker base to wings, in the cerci, and the slender femora, not dilated towards base; while the antennae are very much finer. We have two males; one was taken with the sweep net in tall grass on a small coral island west of Groote Eylandt, and the other at Emerald River, Groote Eylandt. The type is figured.

TENODERA Burmeister, 1838 (aridifolia).

Hab. Ethiopian, Oriental, Malayan regions, and Australasia.

TENODERA INTERMEDIA Saussure.

Plate xxi, fig. 54.

Tenodera intermedia Sauss., Add. Syst. Mant., 1870, p. 233; Mém. Soc. Genève, xxi, 1871, p. 98; Gigl-Tos, Bull. Soc. Ent. Ital., 1911, p. 41; *Tenodera superstitiosa bokiana*, Sjöst., Ark. f. Zool., xi, 1918, p. 22, pl. iv, fig. 5a–b.

Hab. Queensland, Northern Territory (Roper River), New Zealand, and New Guinea.

The rather poor example figured is a female from Emerald, Queensland.

TENODERA AUSTRALASIAE Leach.

Plate xxi, fig. 55.

Mantis australasiae Leach, Zool. Misc., i, 1814, pl. xxxiv; Saussure, Mém. Soc. Genève, xxi, 1871, p. 96; *Mantis darchii* Macleay, King's Survey Aust., ii, 1827, p. 454; *Mantis tesselata* Burm., Handb. Ent., ii, 1838, p. 535.

Hab. Australia and Tasmania, New Zealand, New Guinea, and the Molucca Islands.

This is a common species all over Australia; the specimen figured is from Adelaide. The sexes are similar, the male being smaller, and the colour is either grayish-brown or bright green. One specimen taken by the author near Adelaide has the hind-wings almost entirely dark, except for a small area in the centre.

SPHRODROPODA Stal, 1877 (tristis).

Hab. Australia.

SPHODROPODA TRISTIS Saussure.

Plate xix, fig. 48.

Mantis tristis Sauss., Mém. Soc. Genève, xxi, 1871, p. 93; *Sphodropoda tristis* Westwood, Rev. Mant., 1889, p. 13, pl. x, fig. 2, 9.

Hab. Fiji, Queensland, South Australia, Victoria.

There are one male and four females in the collection from South Australia, the female figured is from Mount Bryan (Victoria), and is dark-brown in colour. Giglio-Tos describes the sexes as green, but otherwise agreeing, from Cape York. It is probable that many of the species of *Sphodropoda* and allied genera are dimorphic.

SPHRODROPODA MOESTA Giglio-Tos.

Sphodropoda moesta Giglio-Tos, Bull. Soc. Ent. Ital., 1911, p. 16.

Hab. Cape York.

This appears to be the dark form of *S. tristis*, and the description agrees with specimens so labelled in our collection.

SPHODROPODA VIRIDIS sp. nov.

Plate xvii, fig. 34.

♂ Green. Close to *S. tristis*. Head similar, fore-margin of facial shield straight. Shaft of pronotum longer and more slender, prosternum greenish. Wings hyaline, fore-margins opaque, greenish. Fore-wings with stigma obscure, not marked with black, fore-margin beneath reddish. Base of each segment of abdomen beneath with a black median spot, as in *S. tristis*, cerci long, slender, hairy. Anterior coxae green, with a front marginal row of small spines; femora similar to *S. tristis*, two pale brown dots on inner margin, inner face of tibia black. Legs short, stout, green. Length, 41 mm., pronotum, 11 mm., fore-wing, 35 mm.

Hab. South Australia: Mount Painter, Flinders Range (H. G. Stokes). Type, I. 14061.

Allied to *S. tristis*, from which it is distinguished by the different anterior coxae and green colour.

SPHODROPODA MJOBERGI Sjöstedt.

Sphodropoda mjöbergi Sjöst., Ark. f. Zool., xi, 1918, p. 25, pl. v, fig. 2, 3.

Hab. North-west Australia (Type), Northern Territory (Roper River), Melville Island, Groote Eylandt.

Most of the specimens are dark in colour; we have one female from Point Charles which is green, but is not otherwise distinguishable.

SPHODROPODA LORIPES sp. nov.

Plate xviii, fig. 42.

♂ Small, green. Head somewhat triangular, vertex nearly straight, clypeus narrow, transverse, quadrilateral, margins straight, facial shield transverse, five-sided, fore-margin straight, eyes projecting, antennae moderately fine. Pronotum somewhat shape of *S. tristis*, but much narrower and longer in proportion, margins not serrated, surface of pronotum smooth. Wings hyaline, fore-margins opaque, green. Anterior coxae unarmed; femora with four discoidal spines, an interior marginal row of sixteen spines, the first eleven nearly equal sized, the twelfth, fourteenth, and fifteenth small, sixteenth large (in *S. tristis* the spines are alternately large and small), and an outer marginal row of four rather small spines;

tibia armed internally with thirteen, and externally with eleven spines. Legs short, stout, green. Length, 40 mm., pronotum, 13 mm., fore-wing, 30 mm.

♀ Green. Much larger than the male. Head larger, more rounded, vertex strongly arched, eyes less prominent, antennae very fine, ocelli small. Pronotum nearly the shape of *S. tristis* female, but narrower in front, margins serrated. Wings long, broad, opaque, green, traces of a stigma green, margin of fore-wing beneath red. Abdomen rather broad, green. Anterior coxae with a row of about eleven fore-marginal spines; femora armed on inner margin with fifteen spines, arranged as in male; tibia with nine external and thirteen internal marginal spines. Inner face of first tarsal joint black, except at base. Legs green. Length, 52 mm., pronotum, 17 mm., fore-wing, 36 mm.

Hab. Queensland: Cunnamulla (H. Hardcastle). Types, I. 14071.

This distinct species, of which we have two examples, is allied to *S. tristis*.

NGAWALA gen. nov.

Allied to *Sphodropoda*. Head more compressed, facial shield not transverse. Male with wings long, the margins straight, and with a long median opaque stigma on elytra. Females with wings abbreviated, rounded, reaching two-thirds length of abdomen; costal margin of elytra strongly rounded. Anterior tibiae armed externally with thirteen spines, the thirteenth very small.

Type, *Hierodula dentifrons* Stal.

This genus is intermediate between *Parhierodula* and *Sphodropoda*. The name is derived from a native word, "ngawal" (Kakurera tribe), meaning "mantis."

NGAWALA DENTIFRONS Stal.

Plate xviii, fig. 43–44; xix, fig. 49.

Hierodula dentifrons Stal, Bih. Svenska Akad., iv, 1877, p. 56; *Sphodropoda dentifrons* Kirby, Cat. Mant., 1904, p. 242.

♂ Smaller than female. Head and pronotum similar, the margins of pronotum faintly serrated. Wings longer than abdomen; elytra narrow, hyaline, fore-margin green, the hind wings wide, hyaline, the fore-margin green. Anterior coxae green, femora green, with three brown spots on inner margin of femur, and a median brown area. Legs greenish. Length of body, 60 mm., of pronotum, 18 mm., expanse of elytra, 96 mm. Darke Peak, South Australia (R. G. Walsh). Type, male, I. 14059.

Hab. South Australia, Central Australia, and Western Australia.

The typical form has a large ferrugineous spot on the inner face of the front femora. In eight female specimens from the interior this is absent.

PARHIERODULA Giglio-Tos, 1911 (venosa).

Hab. Australasia, extending as far west as Wallace's line.

PARHIERODULA PUSTULIFERA Wood-Mason.

Plate xviii, fig. 45; xxi, fig. 52.

Rhombodera pustulifera Wood-Mason, Proc. Zool. Soc. Lond., 1878, p. 583, pl. xxxvi, fig. 6, 6a; *Parhierodula pustulifera* Giglio-Tos, Bull. Soc. Ent. Ital., 1911, p. 124.

♂ Smaller than female, green. Head and pronotum similar, antennae somewhat longer, the margins of pronotum plain. Wings longer, hyaline, the elytra much narrowed, with fore-margin less dilated and opaque. Anterior legs orange-coloured on inner face, coxal spines blunt, small, and somewhat widely separated. Length of body, 59 mm., pronotum, 18 mm., elytra, 41 mm. Darwin (W. K. Hunt). Type, male, I. 14062.

Hab. Queensland (Torres Strait Islands, type), Northern Territory, Groote Eylandt, Bouru, Obi, and Ké.

The female illustrated was taken on Groote Eylandt. It measures 74 mm. in length.

PARHIERODULA STERNOSTICTA Wood-Mason.

Hierodula sternosticta Wood-Mason, Journ. Asiat. Soc. Beng., li, 1882, p. 31; *Parhierodula sternosticta* Gigl.-Tos, Bull. Soc. Ent. Ital., 1911, p. 114; *Hierodula biroi* Brancsik, Ser. Orth. nov., 1897, p. 61, pl. i, fig. 7a–b; *Hierodula punctipectus* Brunner, Orth. Mal. Arch., 1898, p. 212, pl. xvi, fig. 18.

Hab. Australia: Trinity Bay (Wood-Mason), New Guinea.

PARHIERODULA QUINQUEDENS Macleay.

Plate xxi, fig. 53.

Mantis quinquedens Macl., King's Survey Aust., ii, 1827, p. 454; *Hierodula quinquedens* Saussure, Mém. Soc. Genève, xxi, 1871, p. 78; xxiii, 1873, p. 42, pl. viii, fig. 8, 8a; Wood-Mason, Journ. Asiat. Soc. Bengal, li, 1882, p. 28; *Sphodropoda quinquedens* Kirby, Cat. Mant., 1904, p. 242.

Hab. Queensland, Northern Territory, Groote Eylandt.

A Groote Eylandt female is figured. This species is somewhat aberrant, and shows relationship with *Sphodropoda*, but is best retained in the above genus.

PARHIERODULA DIMORPHA Werner.

Hierodula dimorpha Werner, Abh. Senckenb., xxxiii, 1911, p. 394.

Hab. New South Wales.

PARHIERODULA WERNERI Giglio-Tos.

Parhierodula werneri Gigl.-Tos, Bull. Soc. Ent. Ital., 1911, pp. 112, 128; Sjöstedt, Ark. f. Zool, xi, 1918, p. 28.

Hab. Ké Island (Type), North-West Australia.

PARHIERODULA ATRICOXIS Wood-Mason.

Hierodula (Rhombodera) atricoxis Wood-Mason, Proc. Zool. Soc. Lond., 1878, p. 582, pl. xxxvi, fig. 4–4b; *Mantis atricoxis var. grandis* Wood-Mason, Journ. Asiat. Soc. Bengal, li, 1885, p. 31.

Hab. Queensland.

This species is described as having the pronotum strongly dilated in middle and the "whole inner surface of the fore coxae coloured jet black, and the hinder part of the prosternum and the mesosternum symmetrically marked with the same colour."

PARHIERODULA MAJUSCULA sp. nov.

Plate xx, fig. 50–51.

♀ Allied to *P. pustulifera*, but larger. Green, the head wider, vertex less strongly arched, eyes more prominent. Pronotum similar in shape, but constricted posteriorly more than in that species. Prosternum green. Wings broad, well rounded; the elytra opaque, pale green, with veins darker green; hindwings hyaline, the apex pale green. Abdomen yellowish, the cerci coarse and not tapering to apex so gradually as in *P. pustulifera*. Anterior coxae green, inner face with base and apex orange, and the middle broadly jet black, foremargin with a row of sharp, oblique, coxal teeth; femora green, with inner face orange-yellow. Legs green. Length of body, 95 mm., pronotum, 30 mm., expanse of elytra, 113 mm.

Hab. North Queensland: Cairns (A. M. Lea). Type, I. 14058.

No other species of the genus has black and orange front coxae. In *P. atricoxis* the coxae are said to be entirely black on inner face, but the pronotum is figured as of a widely different shape. The prosternum is without markings. This is probably one of the largest Australian mantids. The females figured are from Cairns, and the specimen showing the reverse is the type.

PSEUDOMANTIS Saussure, 1869 (albofimbriata).

Hab. Australia.

PSEUDOMANTIS ALBOFIMBRIATA Stal.

Plate xiv, fig. 23–24.

Mantis albofimbriata Stal, Eugenie's Resa. Ins., 1858, p. 312; *Pseudomantis albofimbriata* Sauss., Mém. Soc. Genève, xxi, 1871, p. 34, pl. iv, fig. 7; Giglio-Tos, Bull. Soc. Ent. Ital., 1911, p. 57.

♂ Smaller than female, green. Head as in female, eyes more prominent, antennae longer, ocelli prominent. Pronotum similar, without marginal serrations. Wings, long, greenish, hyaline, with fore-margins opaque. Anterior femora weaker, with a large black spot on inner face. Length of body, 36 mm., of pronotum, 11 mm., of elytra, 28 mm.

Hab. Tasmania (Type), New South Wales.

The figures show a female from Sydney and the inner face of a male anterior leg. Both sexes have a black spot on the inner face of the front femora.

PSEUDOMANTIS VICTORINA Westwood.

Pseudomantis victorina Westw., Rev. Mant., 1889, p. 36, pl. ix, fig. 6.

Hab. North Australia.

PSEUDOMANTIS HARTMEYERI Werner.

Pesudomantis hartmeyeri Werner, Fauna Sudw. Austral., iv, 1911, p. 51.

Hab. Western Australia.

This species, which was described from larvae, is unknown to me.

STATILIA Stal, 1877 (nemoralis).

Hab. Malay Archipelago.

S. apicalis is known from Australia, New Guinea, and Africa, a strange case of discontinuous distribution.

STATILIA APICALIS Saussure.

Mantis apicalis Sauss., Mém. Soc. Genève, xxi, 1871, p. 291; l.c., xxiii, 1872, p. 48; *Statilia apicalis* Stal, Bih. Svenska Akad., iv, 1877, p. 55; Gigl.-Tos, Bull. Soc. Ent. Ital., 1911, p. 9; *Pseudomantis apicalis* Kirby, Syn. Cat. Orth, 1904, p. 235.

Hab. New South Wales, Queensland.

MANTIS Linnaeus, 1758 (religiosa).

Hab. Europe, Asia, Africa, and one species from Australia.

MANTIS OCTOSPILOTA Westwood.

Plate xxii, fig. 58.

Mantis octospilota Westw., Rev. Mant., 1889, p. 35; Giglio-Tos, Bull. Soc. Ent. Ital., 1911, p. 15.

Hab. North-west Australia, Western Australia, North-west of South Australia, Queensland, Northern Territory.

The male is figured. The female is larger than the male, and has the wings more opaque. Both sexes have a black spot at the base of inner face of fore-coxae, and the prosternum is also suffused black. It was first described from Adelaide. Specimens from Roper River have the black spots widened into short lateral black bars.

AUSTROMANTIS Sjöstedt, 1918 (albomarginata).

Hab. Australia.

AUSTROMANTIS ALBOMARGINATA Sjöstedt.

Austromantis albomarginata Sjöst., Ark. f. Zool., xi, 1918, p. 28, pl. iii, fig. 1–2.

Hab. North-west Australia, Northern Territory, Groote Eylandt.

AUSTROMANTIS GRACILIS Sjöstedt.

Austromantis gracilis Sjöst., Ark. f. Zool., xi, 1918, p. 30, pl. iv, fig. 1.

Hab. Western Australia, North-west Australia, Groote Eylandt.

NOTOMANTIS gen. nov.

Allied to *Mantis*. Head with vertex straight, eyes prominent, divergent, facial shield strongly transverse. Pronotum with sides depressed, the anterior portion constricted and forming a median ridge. Wings (in the male) rather long, hyaline, the fore-margin of elytra rounded, with traces of a stigma. Abdomen short, the cerci small. Anterior coxae armed with small teeth; the femora rather strong, armed with four short discoidal spines, an inner marginal series of fourteen irregular small spines, and an outer marginal series of four larger spines; tibiae armed externally with eight, internally with eleven graduated spines. Legs long and slender.

Type, *N. chlorophana* sp. nov.

NOTOMANTIS CHLOROPHANA sp. nov.

Plate xxii, fig. 57.

♂ Green. Head green, antennae long, stout, black, except at base. Pronotum green, smooth, the margins darker. Wings green, hyaline, the fore-margins opaque, the apex tipped black; the fore-margin of elytra beneath black. Anterior legs green, the apex of coxae and an obscure patch on inner face of

femora darker. Legs green, the base of femora darker green. Length of body, 41 mm., of pronotum, 12 mm., expanse of elytra, 70 mm.

Hab. Western Australia: Beverley (F. H. du Boulay). Type, I. 14072, unique.

TRACHYMANTIS Giglio-Tos, 1916 (obesa).

TRACHYMANTIS OBESA Giglio-Tos.

Trachymantis obesa Gigl.-Tos, Bull. Soc. Ent. Ital., 1916, p. 46.

Hab. Australia. ?

This species is recorded: "da Hermannsburg nell Africa centrale (Mus Londra)." Hermannsburg is between Oodnadatta and Charlotte Waters, Central Australia.

DEIPHOBE Stal, 1877 (ocellata).

Hab. India and Australia.

DEIPHOBE AUSTRALIANA Giglio-Tos.

Deiphobe australiana Gigl.-Tos, Bull. Soc. Ent. Ital., 1915, p. 24.

Hab. Australia.

THORODIA gen. nov.

Male with head moderately large, about as high as wide, eyes rounded, prominent; vertex strongly arched; facial shield transverse, elevated above; clypeus quadrilateral; sides diverging, hind margin nearly straight; ocelli large, closely grouped together. Pronotum about four times long as wide; widest at one-fourth, margins anteriorly serrate, a moderate median ridge. Wings long, nearly reaching tip of abdomen, hyaline, coloured. Abdomen slender, parallel-sided, anal appendages large; cerci stout, short, cylindrical, with nine apparent joints, apical joints compressed, clothed with moderately dense setae. Anterior femora moderate, with four discoidal spines, the second very small, also an inner marginal row of fourteen nearly equal spines and an isolated apical spine, outer margin armed with five spines, the second the largest, and the fifth at apex; tibiae armed on inner margin with thirteen graduated spines, the outer with seven or eight; tarsi short, first joint as

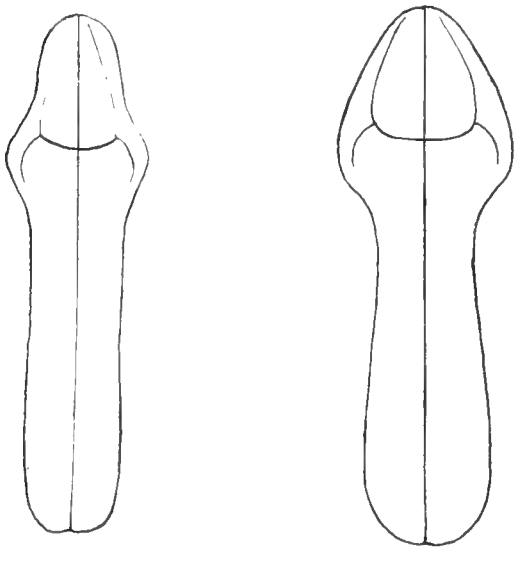

Fig. 377. *Thorodia melanoptera* sp. nov. ♀, and *T. m. major* subsp. nov. ♀.

long as four following, clothed with fine hairs. Legs slender and rather long. The female is larger, stouter, the pronotum more dilated, wings short, only half length of abdomen, hyaline, coloured, hind-wings semiovate, as wide as long.

Type, *T. melanoptera* sp. nov.

THORODIA MELANOPTERA sp. nov.

Plate xviii, fig. 46; xxii, fig. 59, and text figure 377.

♂ Brown. Head about as high as wide; clypeus transverse, quadrilateral; facial shield transverse, fore-margin concave, hind-margin produced to a point; ocelli large, rounded, close together; vertex arched, the middle a trifle flattened, forming an elevated transverse rounded ridge, mottled brown. Pronotum narrow, somewhat sparsely punctured in longitudinal rows; a supracoxal dilatation at one-third. Elytra long, hyaline, pale brownish; hind-wings large, hyaline, brownish black, with numerous short transverse whitish lines, fore-margin straight, blackish, opaque, interior to this the wing is very transparent, darkening towards posterior margin. Abdomen brownish, slender, cylindrical, cerci stout, flattened at apex, clothed with fairly dense setae. Fore-coxae margined in front with six weak spines, inner face light brown, with several transverse blackish bands more or less obscure, outer face brownish. Femora brown, sometimes an obscure black spot in femoral groove. Legs brown. Length, 47 mm., elytra, 32 mm., hind-wings, 29 mm.

♀ Dark brown. Head as in male, but larger, ocelli smaller. Pronotum broad, strongly dilated, a slight constriction between supracoxal dilatation and fore-margin. Fore-wings short, rounded, opaque, brownish, with darker veins. Hind-wings short, as wide as long, black, with transverse, short, transparent, whitish lines at veins. Abdomen broad, parallel-sided, brown, cerci coarse, cylindrical, setose, the two apical segments flattened. Anterior coxae and femora mottled brown and black. Legs brown. Length, 61 mm., elytra, 19 mm., hind-wings, 14 mm.

Hab. South Australia: Murray River (H. S. Cope), Mindarie, Fowler Bay, Port Augusta, Alford, Halidon, Lameroo, Adelaide, Lucindale (A. M. Lea); Victoria: Kewell.

Types, I. 14064.

THORODIA MELANOPTERA MAJOR subsp. nov.

Plate xxii, fig. 60; and text figure 377.

♂ Similar to *T. melanoptera*, but larger, head more arched, vertex rounded, smooth; pronotum much wider in proportion, fore-margin narrowed, and the

constriction between fore-margin and the dilatation nearly obsolete. Wings with hyaline transverse marks, generally wider and a trifle more obscurely margined. Length, 58 mm.

♀ Head strongly arched, smooth, no plane area on vertex. Pronotum wider, from supra-coxal dilatation to fore-margin convex, broad, behind dilatation strongly constricted, thence widening to posterior margin, the tubercles on pronotum coarse and conspicuous. The legs appear to be stouter and longer. Length, 65 mm.

Hab. South Australia: Kingoonya (R. Harvey), Ooldea (R. T. Maurice); Central Australia: Macdonnell Ranges and Mereenie Bluff (Horn Expedition).

Types, I. 14065.

The males of this desert race of *T. melanoptera* differ most in size, and the females in the shape of the pronotum. We have big series of both races, and there seem to be no intermediates.

SUB-FAMILY VATINAE.

PARADANURIA Wood-Mason, 1877 (orientalis).

Hab. India and Australia.

PARADANURIA FORTNUMI Westwood.

Toxodera (Paradanuria) fortnumi Westw., Rev. Mant., 1889, p. 41, pl. viii, fig. 7.

Hab. North Australia.

AUSTROVATES Sjöstedt, 1918 (variegata).

Hab. Australia.

AUSTROVATES VARIEGATA Sjöstedt.

Plate xxi, fig. 56.

Austrovates variegata Sjöst., Ark. f. Zool., xi, 1918, p. 36, pl. iv, fig. 2a–b; *Heterarchimantis lobata* Wern., Zool. Med. Rijks Mus. Leid., vii, 1922, p. 121.

Hab. North-west Australia, Northern Territory.

The figure is of a female from Roper River.

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EXPLANATION OF PLATES.

Plate xii.

Fig. 1. *Glabromantis unicornis* sp. nov. Type male.
2. *Glabromantis unicornis* sp. nov. Type female.
3. *Glabromantis melania* sp. nov. Type male.
4. *Cliomantis cornuta* Gigl.-Tos., Darwin, male.
5. *Paraoxypilus verreauxii* Sauss., Magnetic Island, male.
6. *Paraoxypilus verreauxii* Sauss., Emerald, female.
7. *Paraoxypilus armatus* Giglio-Tos, Groote Eylandt. Type male.
8. *Paraoxypilus armatus* Giglio-Tos, Daly River, female.

Plate xiii.

Fig. 9. *Paraoxypilus tasmaniensis* Sauss., Tasmania, male.
10. *Paraoxypilus tasmaniensis* Sauss., Adelaide, female.
11. *Paraoxypilus laticollis* sp. nov. Type male.
12. *Paraoxypilus laticollis* sp. nov. Type female.
13. *Paraoxypilus laticollis* sp. nov. Umberatana, female.
14. *Paraoxypilus tasmaniensis* Sauss., Lillimur, male.
15. *Cliomantis dispar* sp. nov., Parachilna, male.

Plate xiv.

Fig. 16. *Orthodera marginata* Sauss., Adelaide, male.
17. *Orthodera marginata* Sauss., Mount Painter, female.
18. *Orthodera ministralis* Fab., Roper River, female.
19. *Orthodera ministralis* Fab., Adelaide, female.
20. *Orthodera ministralis* Fab., left anterior leg, male.
21. *Orthodera burmeisteri* Wood-Mason, Dalby, female.
22. *Orthodera burmeisteri* Wood-Mason, right anterior leg, female.
23. *Pseudomantis albofimbriata* Stal, Sydney, female.
24. *Pseudomantis albofimbriata* Stal, right anterior leg, male.

Plate xv.

Fig. 25. *Rhodomantis gracilis* sp. nov. Type male.
26. *Rhodomantis pulchella* Tepper, Mount Painter, male.
27. *Stenomantis n. biseriata* Westwood, Cairns, female.
28. *Stenomantis n. biseriata* Westwood, Cairns, male.

Plate xvi.

Fig. 29. *Archimantis monstrosa* Wood-Mason, Groote Eylandt, female.
30. *Archimantis monstrosa* Wood-Mason, Roper River, female.

31. *Archimantis sobrina* Saussure, Cunnamulla, female.
32. *Archimantis latistyla* Serville, Adelaide, male.
33. *Archimantis armata* Wood-Mason, Cairns, male.

Plate xvii.

Fig. 34. *Sphodropoda viridis* sp. nov. Mount Painter, male.
35. *Archimantis quinquelobata* Tepper. Type male.
36. *Archimantis quinquelobata* Tepper, Fraser Range, female.
37. *Archimantis quinquelobata* Tepper, right anterior leg, female.

Plate xviii.

Fig. 38. *Archimantis monstrosa* Wood-Mason, Stapleton, male.
39. *Archimantis minor,* Giglio-Tos, Beverley, female.
40. *Archimantis brunneriana* Saussure. Type female.
41. *Nullabora flavoguttata* sp. nov. Type female.
42. *Sphodropoda loripes* sp. nov. Type female.
43. *Ngawala dentifrons* Stal, Yorke's Peninsula, male.
44. *Ngawala dentifrons* Stal, left anterior leg, female.
45. *Parhierodula pustulifera* Wood-Mason. Type male.
46. *Thorodia melanoptera* sp. nov. Murray River, female.

Plate xix.

Fig. 47. *Archimantis latistyla* Serville, Adelaide, female.
48. *Sphodropoda tristis* Saussure, Mount Bryan, female.
49. *Ngawala dentifrons* Stal, Yeelana, female.

Plate xx.

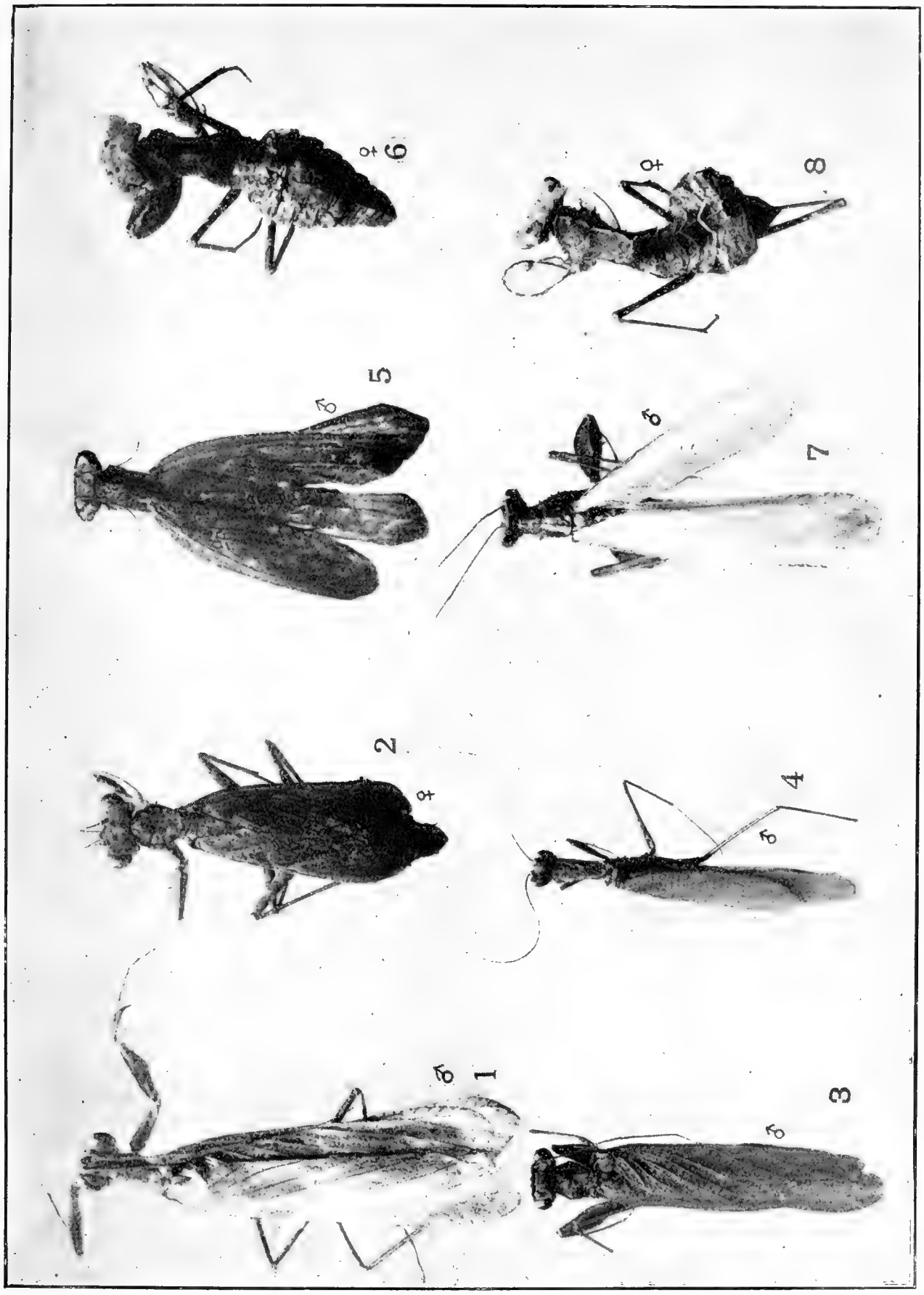
Fig. 50. *Parhierodula majuscula* sp. nov. Cairns, female.
51. *Parhierodula majuscula* sp. nov. Type female, reverse.

Plate xxi.

Fig. 52. *Parhierodula pustulifera* Wood-Mason, Groote Eylandt, female.
53. *Parhierodula quinquedens* Macleay, Groote Eylandt, female.
54. *Tenodera intermedia* Saussure, Emerald, female.
55. *Tenodera australasiae* Leach, Adelaide, male.
56. *Austrovates variegata* Sjöstedt, Roper River, female.

Plate xxii.

Fig. 57. *Notomantis chlorophana* gen.. and sp. nov. Type male.
58. *Mantis octospilota* Westwood, Fortescue River, male.
59. *Thorodia melanoptera* gen. and sp. nov. Type male.
60. *Thorodia m. major* subsp. nov. Type female.



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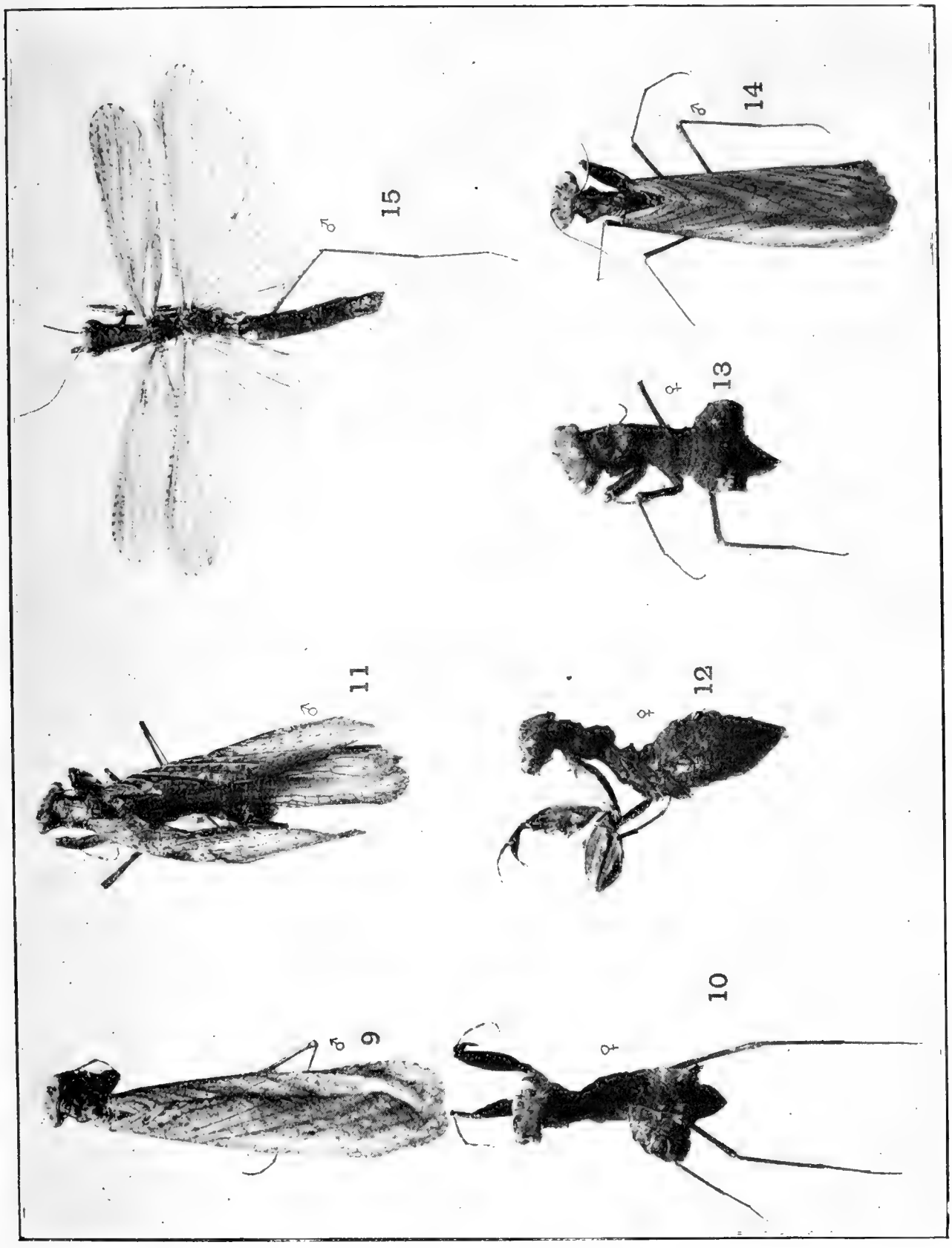

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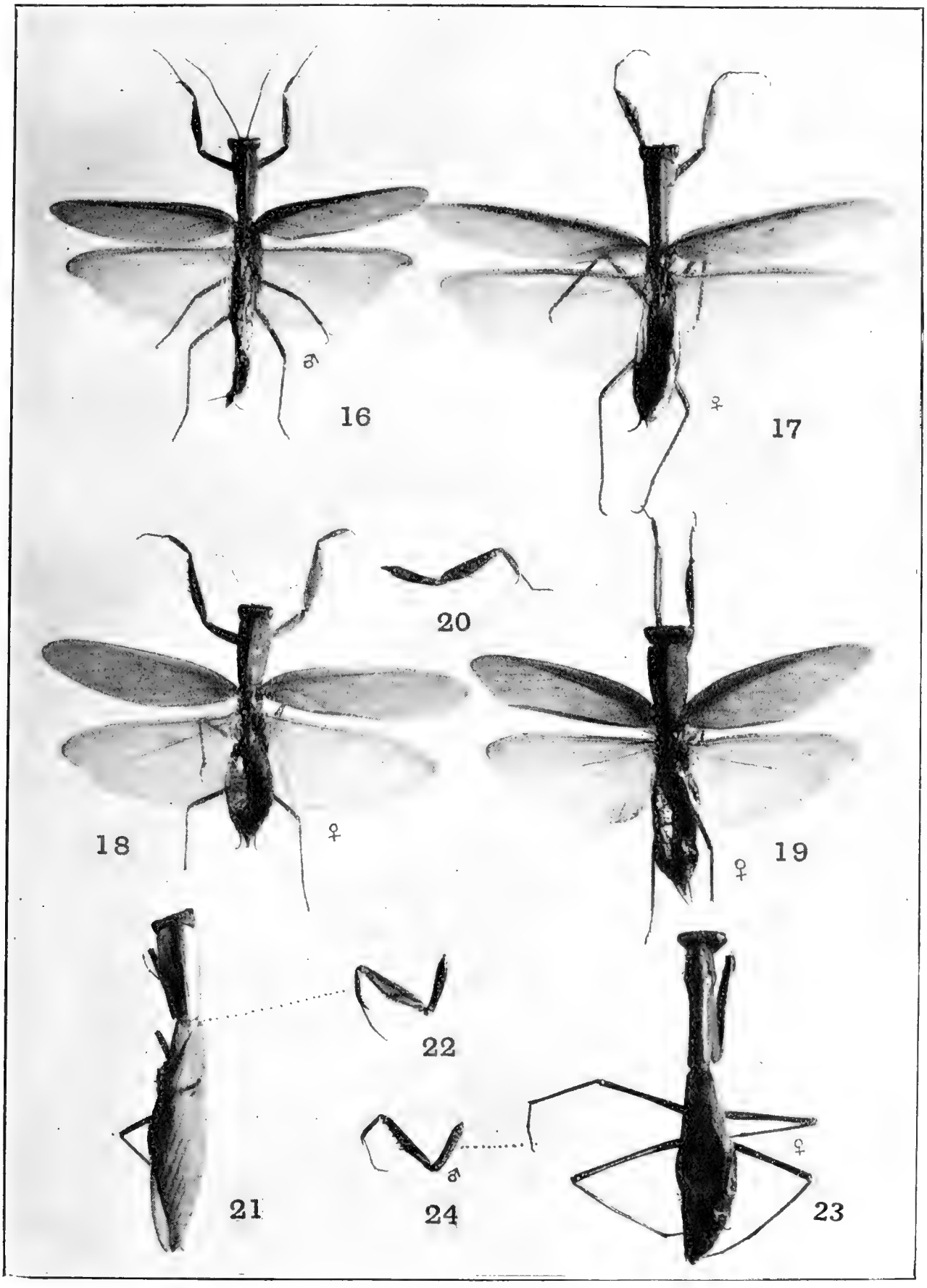

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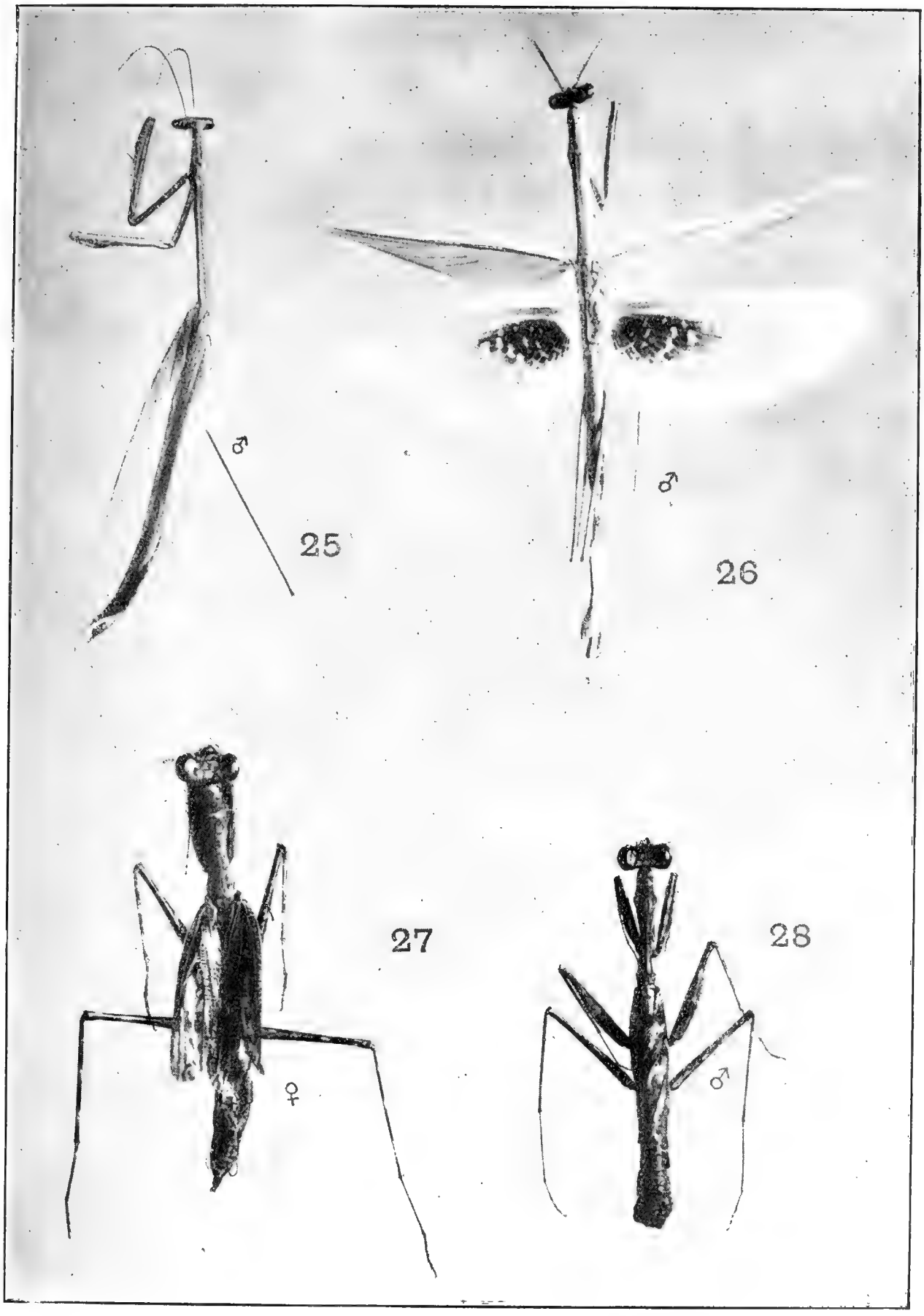

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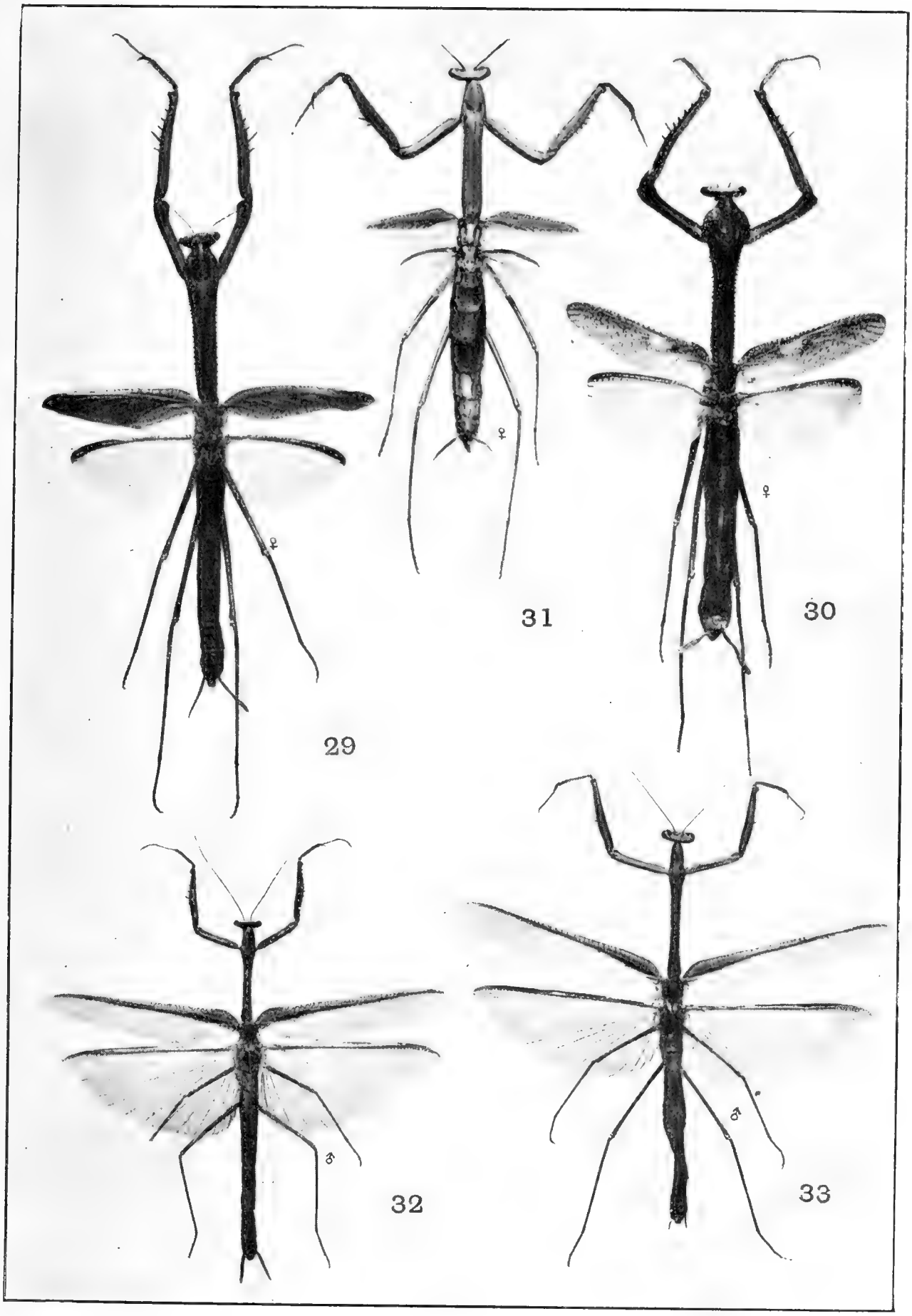

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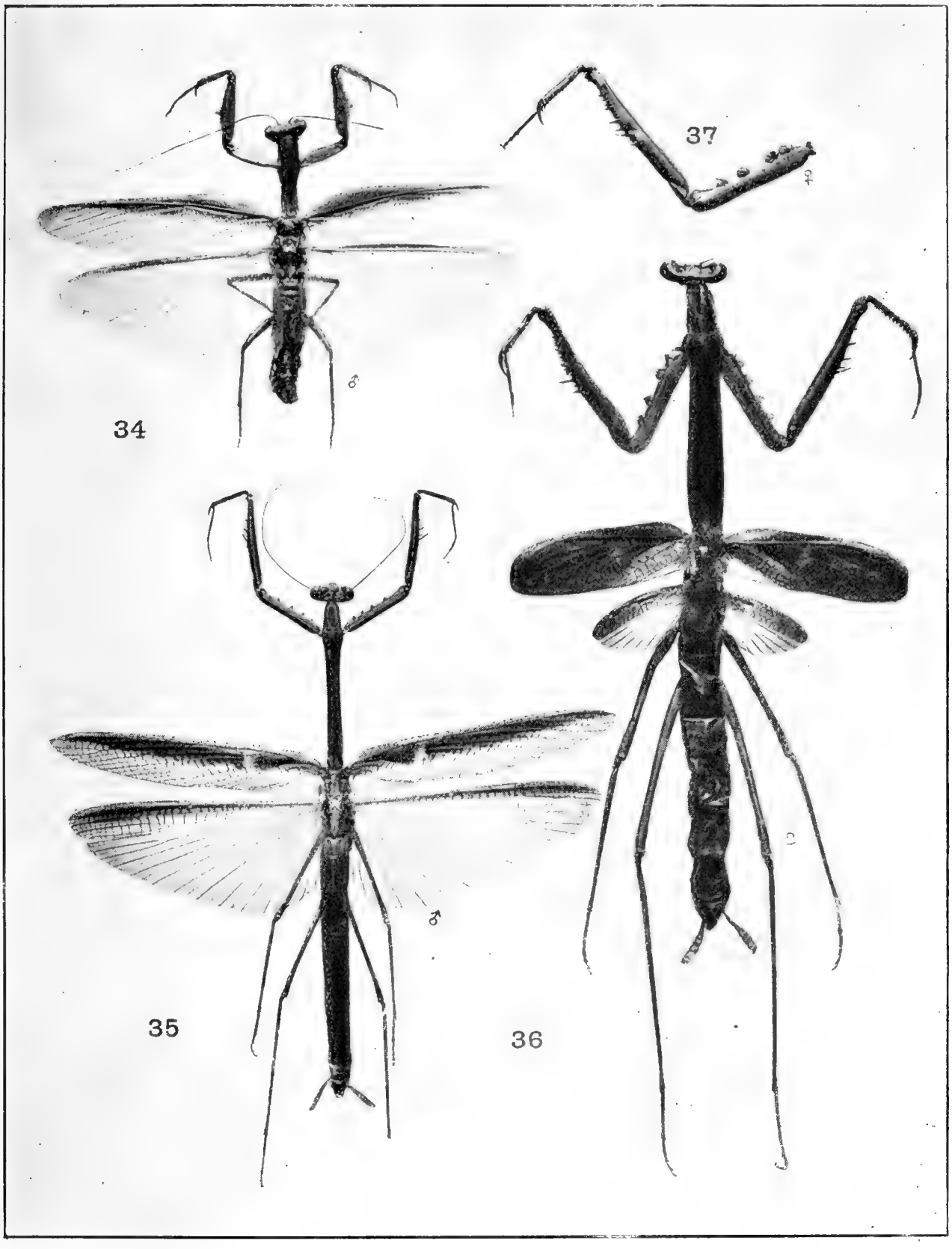

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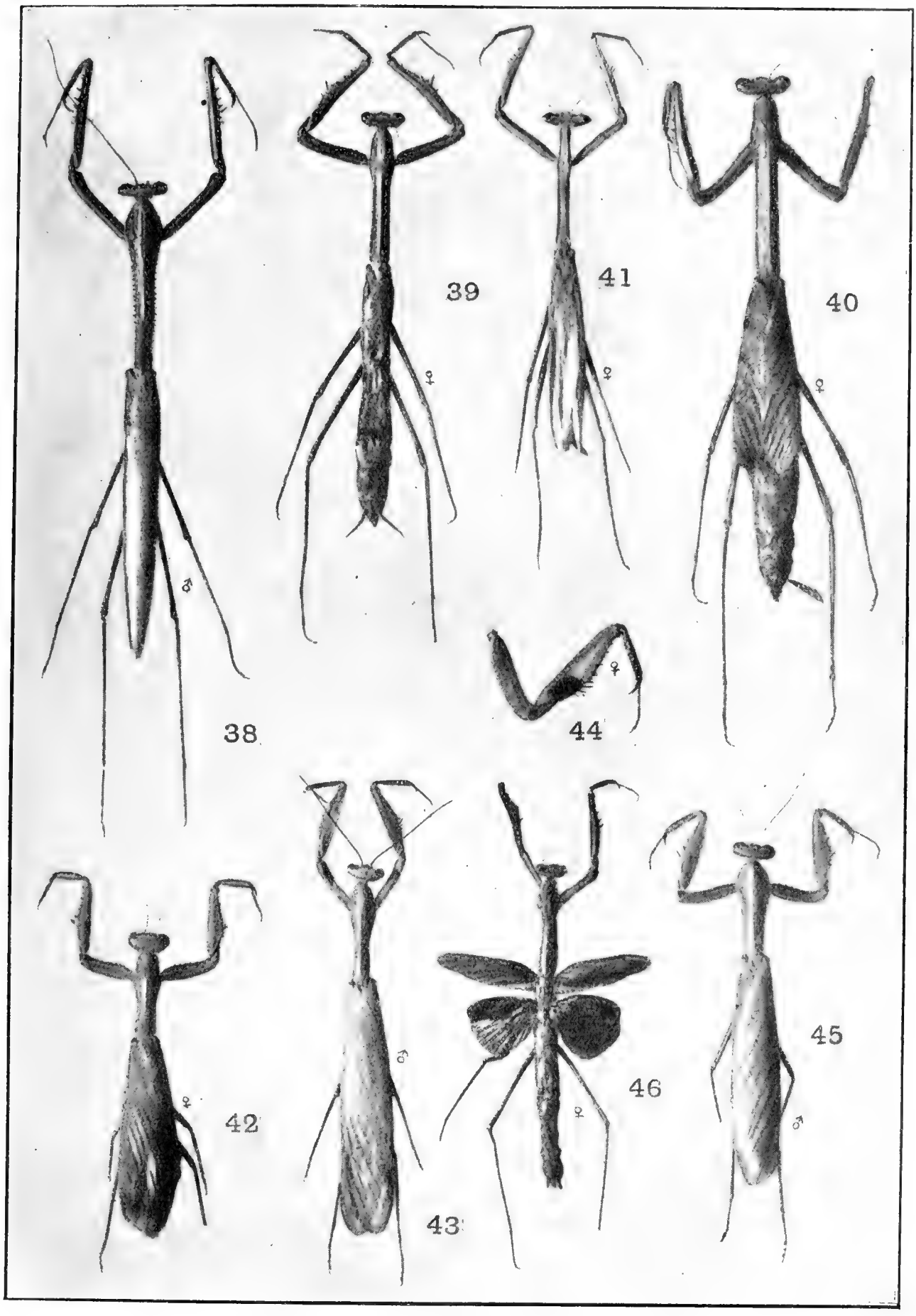

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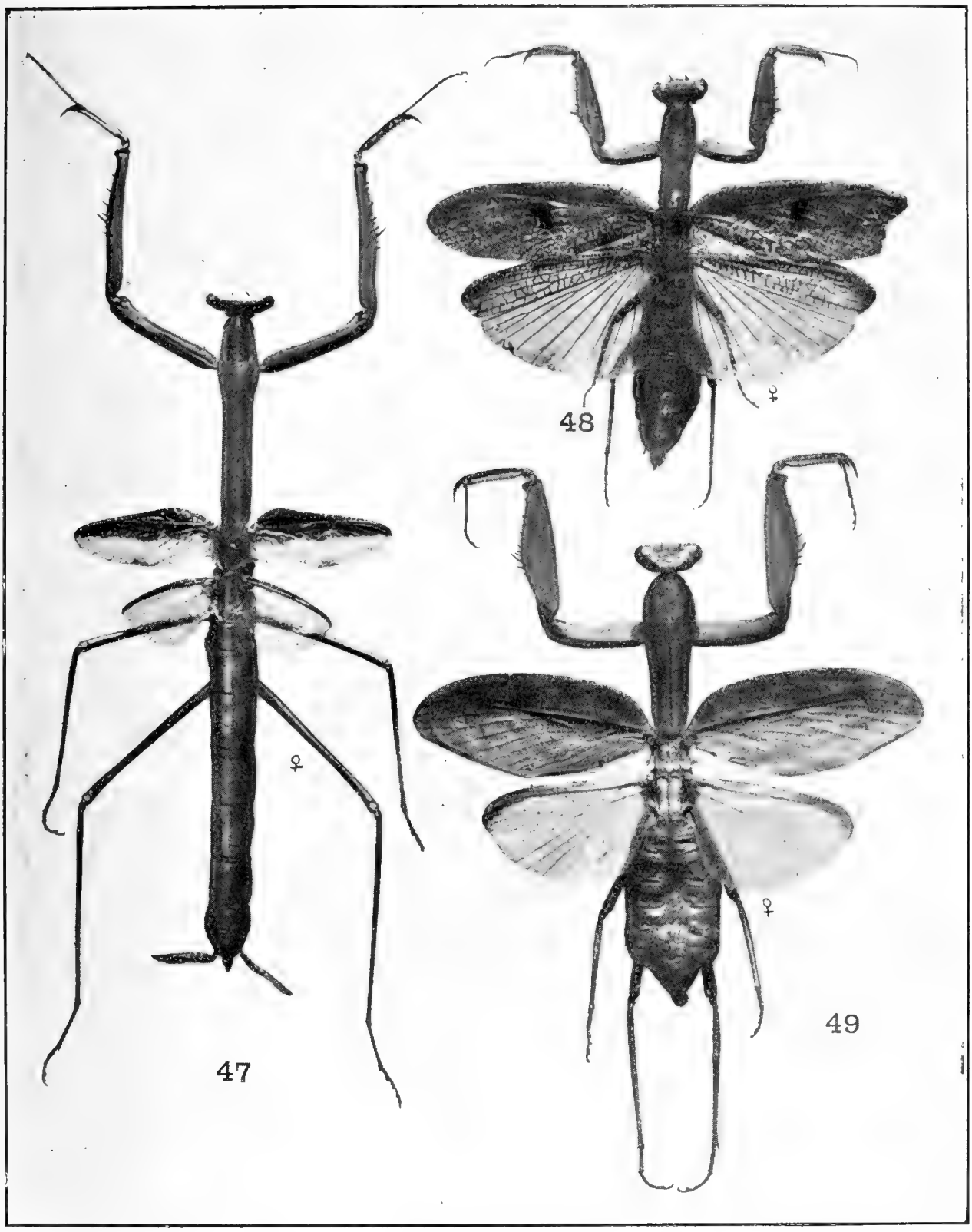

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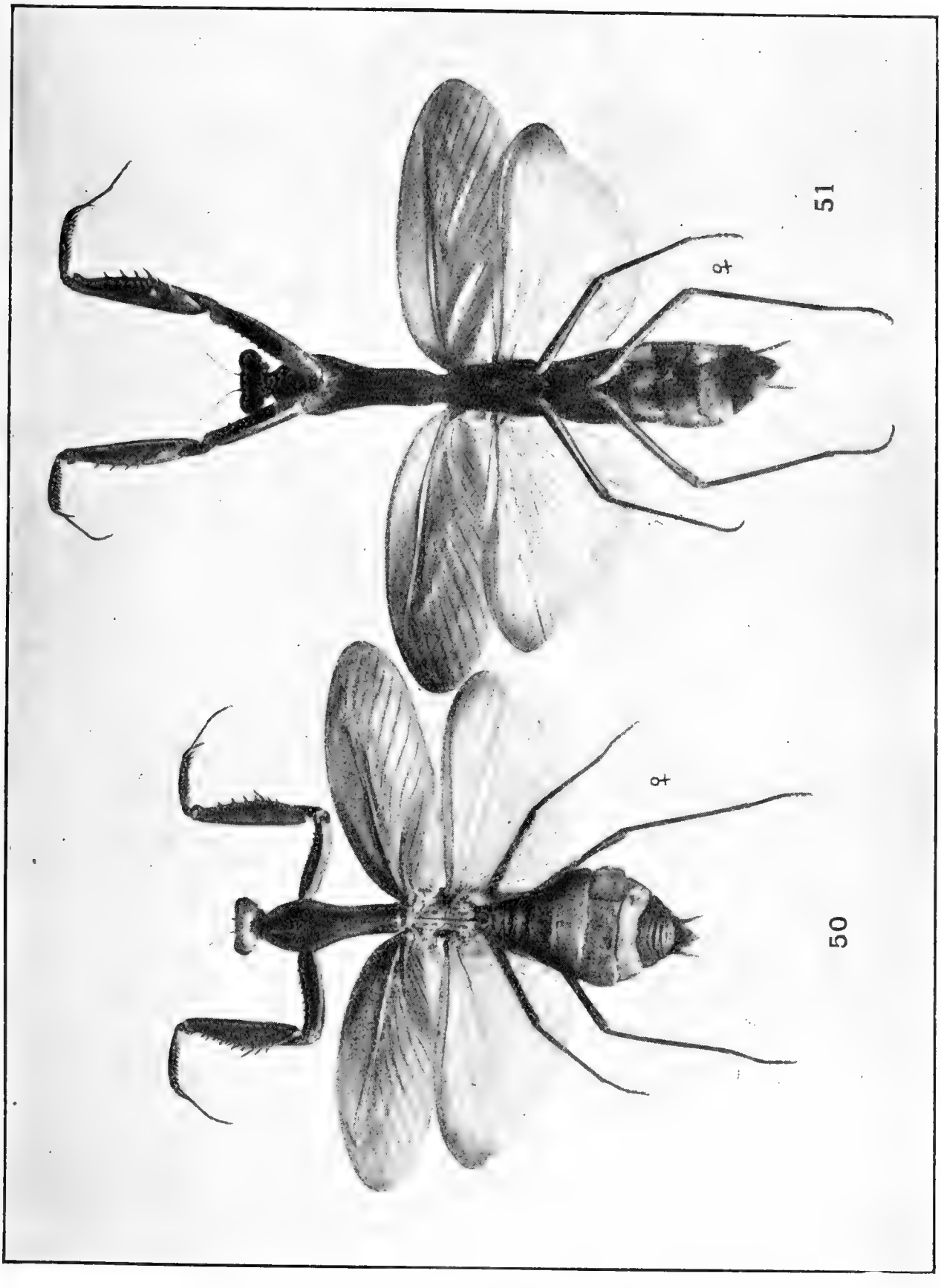

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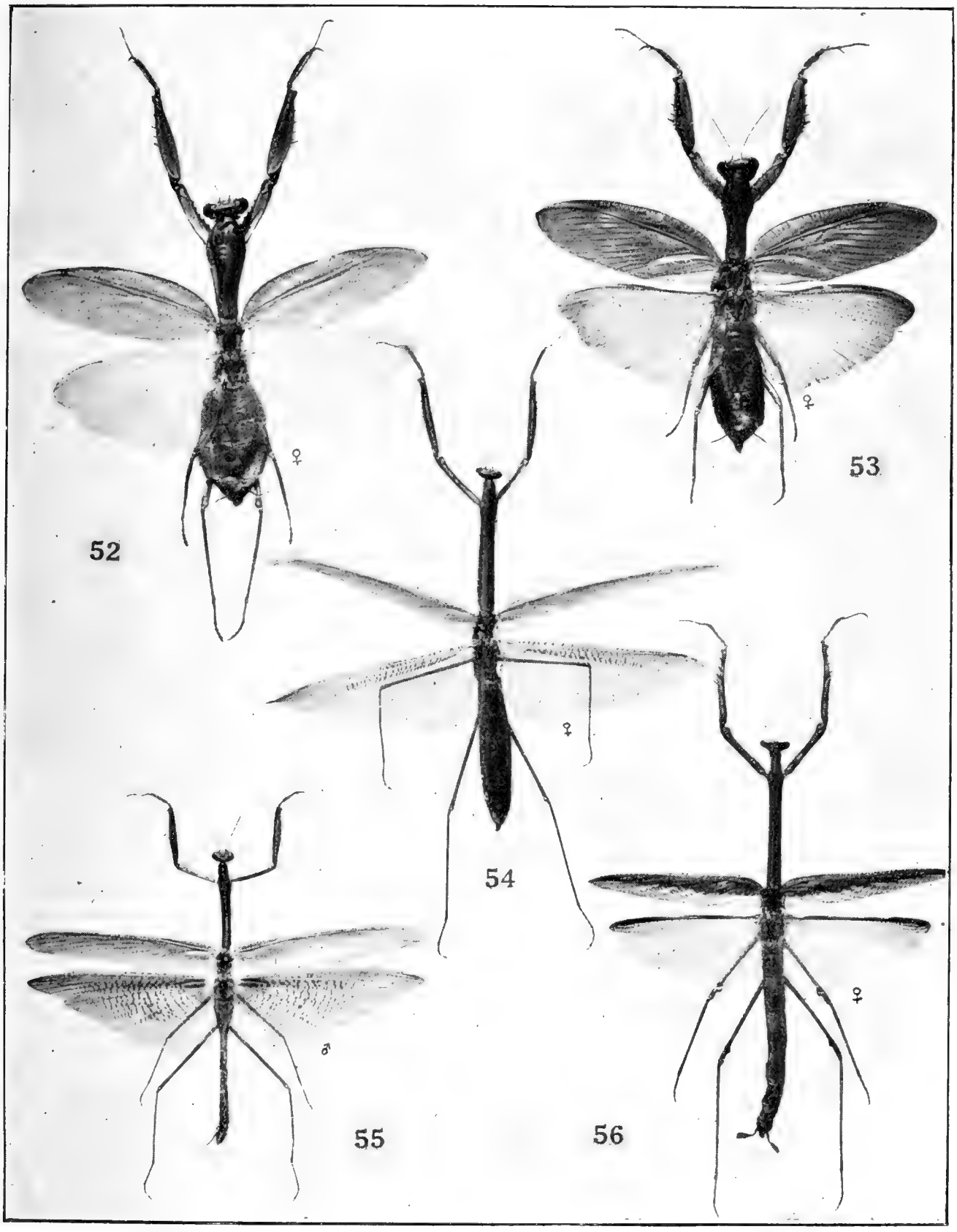

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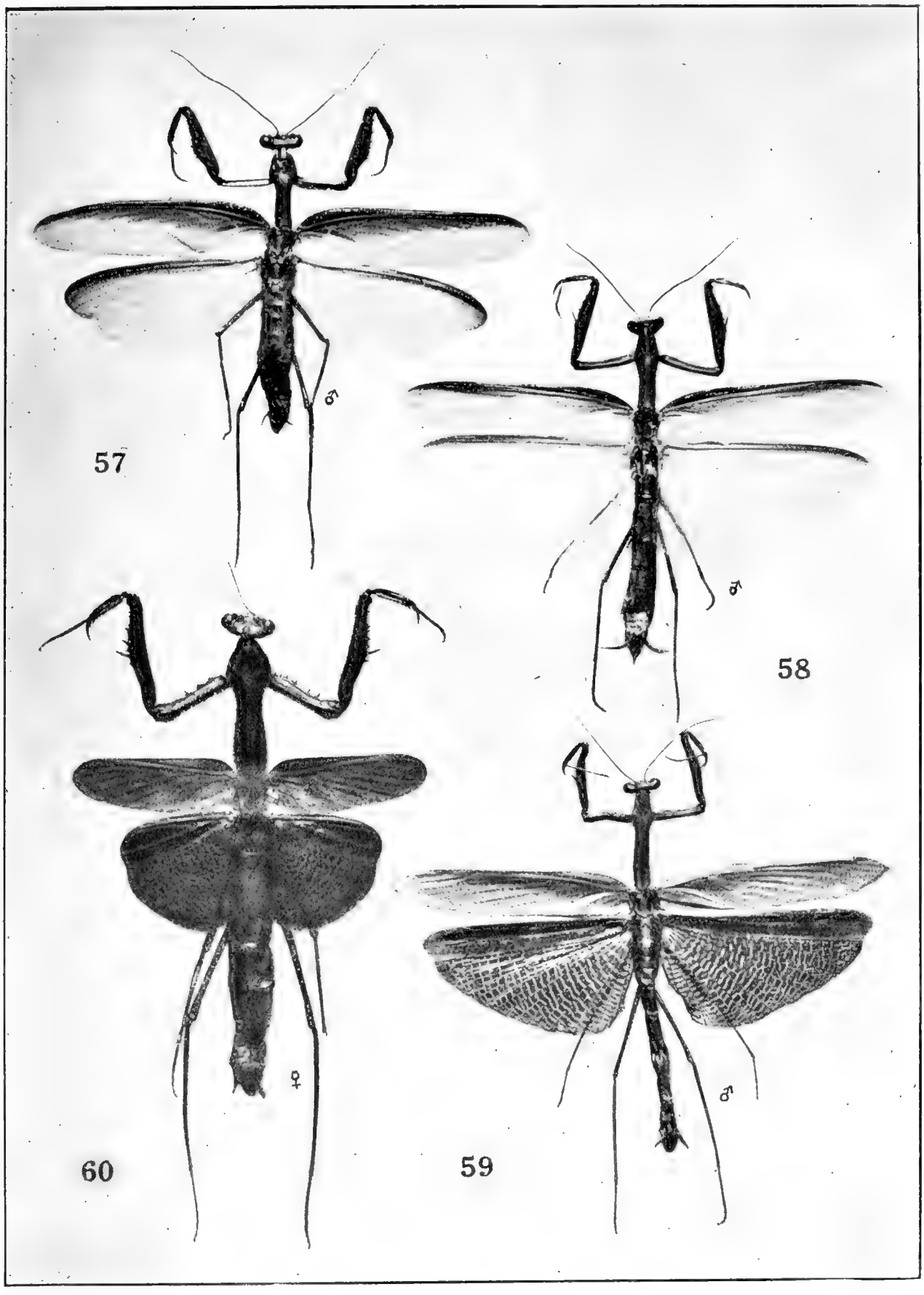

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